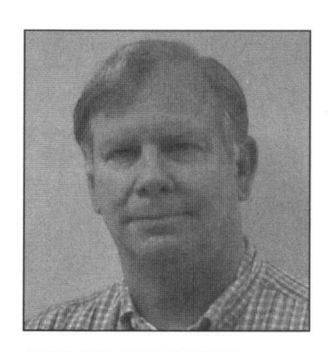


US World War II and Korean War Field Fortifications 1941–53

Gordon L Rottman • Illustrated by Ian Palmer



GORDON L ROTTMAN entered the US Army in 1967, volunteered for Special Forces and completed training as a weapons specialist. He served in the 5th Special Forces Group in Vietnam from 1969–70 and subsequently in airborne infantry, long-range patrol, and intelligence assignments until retiring after 26 years. He was a Special Operations Forces scenario writer at the Joint Readiness Training Center for 12 years, and is now a freelance writer.



IAN PALMER is a highly experienced digital artist. A graduate in 3D design, he has provided illustrations for many publications, from modelling James Bond's Aston Martin to recreating lunar landings. His work for Osprey's Fortress series includes volumes 1: *Japanese Pacific Island Defenses 1941–45* and 23: *German Field Fortifications 1939–45*. He lives and works in London with his wife and three cats.

Fortress • 29



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Measurements

Distances, ranges, and dimensions are given in the contemporary US system of inches, feet, yards, and statute miles rather than metric. To covert these figures to metric the following conversion formulas are provided:

inches to centimeters	multiply inches by 2.540
feet to meters	multiply feet by 0.3058
yards to meters	multiply yards by 0.9114
miles to kilometers	multiply miles by 1.6093

The Fortress Study Group (FSG)

The object of the FSG is to advance the education of the public in the study of all aspects of fortifications and their armaments, especially works constructed to mount or resist artillery. The FSG holds an annual conference in September over a long weekend with visits and evening lectures, an annual tour abroad lasting about eight days, and an annual Members' Day.

The FSG journal *FORT* is published annually, and its newsletter *Casemate* is published three times a year. Membership is international. For further details, please contact:

The Secretary, c/o 6 Lanark Place, London W9 1BS, UK

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Copies of the above field manuals and other manuals may be purchased from Military/Info Publishing (www.military-info.com)

Glossary

AA antiaircraft
ASP ammunition supply point
AT antitank
BAR Browning automatic rifle
COPL combat outpost line
CP command post
DMZ Demilitarized Zone (Korea)
e-tool entrenching tool
HMG heavy machine gun
LMG light machine gun
LP listening post
MLR main line of resistance
NCO non-commissioned officer
OP observation post
OPL outpost line
OPLR outpost line of resistance
RR recoilless rifle
RRL regimental reserve line
UN United Nations

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Introduction

In terms of strategy, in World War II the United States Army and Marine Corps were offensively oriented. There were few situations in which large-scale defensive operations were necessary, though there were notable exceptions. The beginning of the war found US and Filipino forces on Luzon conducting an army-level defensive operation on Bataan Peninsula. Prolonged defensive corps-level battles for beachhead lodgments were fought on Guadalcanal, Bougainville, and New Britain between 1942 and 1944. In Europe the 1944 defense of Bastogne was America's most noted large-scale defensive battle. The Korean War began with a defensive battle, the army-level defense of the Pusan Perimeter. After a phase of seesaw offensives and withdrawals, the conflict bogged down into World War I-style positional warfare and to this day the belligerents face each other across the no-man's land of the Demilitarized Zone.

A Marine 75mm M1A1 pack howitzer is emplaced in a Tinian sugarcane field in an improved crater created by a large-caliber naval shell.



The field fortifications built in the major World War II defensive battles were temporary in nature. Despite the orientation toward the offensive, all units prepared defensive positions when halted for the night or as part of a holding action while other forces advanced. US field fortifications tended to be simple, and as little effort and as few resources as possible were expended on them, even if they were to be occupied for weeks. Even in the prolonged static warfare phase of the Korean War, though much effort went into preparing robust field fortifications, they were still considered temporary.



This 82d Airborne Division 81mm mortar crew of glider troops has dug a near regulation emplacement and camouflaged it reasonably well from ground observation.

American tactical defense doctrine

The construction of field fortifications and obstacles is prescribed in the US Army's Engineer Field Manual (FM) 5-15, *Field Fortifications*. Both the Army and Marine Corps used this manual. The 1940 edition, in use at the beginning of the war, was based on World War I experiences. While it included updated field fortifications for new weapons and more dispersed unit defensive positions, much space was allotted to elaborate trench systems and facilities such as underground kitchens, latrines, and troop shelters. The same applied to the construction of vast in-depth obstacle systems and almost permanent crew-served weapons positions. Hastily dug positions used by infantrymen and their accompanying crew-served weapons were given minimal space. The first three months of America's first major offensive, Guadalcanal in 1942, proved to be a defensive battle to hold the Henderson Field perimeter. It was realized there that fixed, in-depth defenses were unnecessary against a lightly armed enemy lacking heavy artillery, significant armor, and air superiority. It was here that the Marines learned to copy the Japanese foxhole, dug deep to protect against artillery fire and allow a man to fight standing.

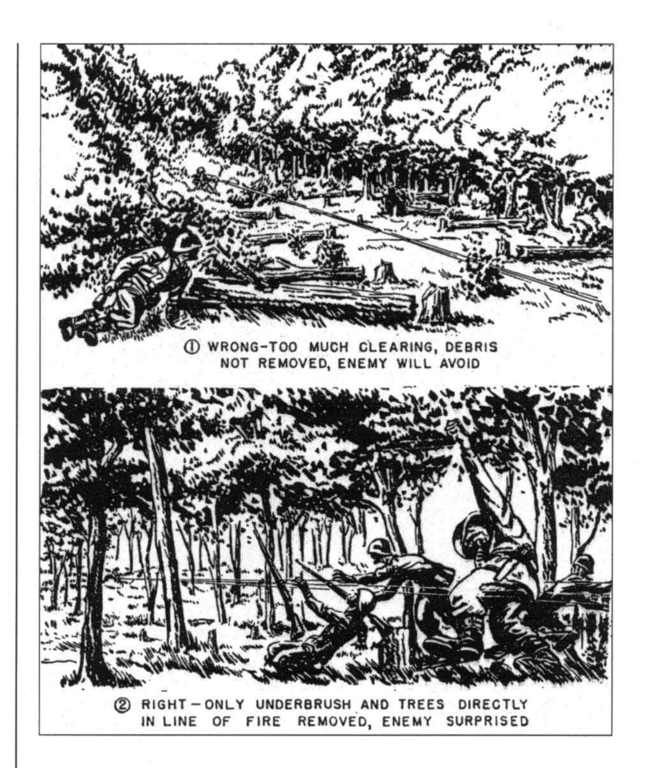
The 1944 edition of FM 5-15 deleted most of the trench warfare and elaborate obstacle information, added simple and quickly dug infantry and crew-served weapons positions, included new types of emplacements to accommodate recently fielded weapons, and exploited the lessons learned in combat. Protection from artillery, tank, and air attack received special emphasis.

The 1949 edition was distributed on the eve of the Korean War, and incorporated the lessons learned in World War II and positions for new types of weapons. It almost appears that the manual was written to support operations in Korea, with information on protective bunkers for crew-served weapons and troops as well as simplified trench systems. This was due to the threat that nuclear weapons now posed on the battleground, but would prove to be well suited for resisting massed artillery barrages experienced later on Korean hills. Additional information was provided on field fortifications in cold weather conditions, some based on German experiences on the Eastern Front.

Unit defensive principles

US forces employed a triangular structure at all echelons from regimental to squad level, and standard practice was for one-third of a given echelon's subunits to be kept in reserve ("two up, one back"). With relation to frontline strength, the infantry division had three regiments, each with three battalions—a total of nine battalions. Each battalion had three rifle companies for a divisional total of 27 companies. The 27 rifle companies comprised 81 rifle platoons. The two frontline regiments thus had two battalions each in the line for a divisional total of four battalions out of nine. These four battalions each had two rifle companies in the line so that the divisional front was covered by eight out of the 27 companies. Of the division's 81 rifle platoons only 16 truly manned the frontline. Realistically each company's support rifle platoon could be considered to be in the frontline as well as it was usually in sight of the two forward platoons and able to provide covering fire—thus meaning there were 24 rifle platoons in the division's frontline. This second-echelon platoon was referred to as a "support platoon" rather than a reserve. At higher echelons the second-echelon company, battalion, or regiment was designated the "reserve."

There were of course situations where all three of a given echelon's subunits were required to man the frontline, especially in quiet sectors or if assigned



Care had to be taken when clearing fields of fire in order to ensure they were not conspicuous.

frontages were too wide. Commanders attempted to avoid the latter, but it was common. In this case, though, some form of reserve was established. For example, a battalion forced to place all three companies in the frontline might place one of the companies' platoons, reinforced with battalion support elements, in battalion reserve—but the contributing company was deprived of its support.

In such circumstances, units other than infantry were often employed as reserves or to man 'quiet' sectors. In Europe, Army combat engineer units were frequently employed as infantry, being organized similarly and possessing crew-served weapons. The Marines commonly used engineers, pioneers, amphibian tractor, and even artillery units as infantry, such as on Guadalcanal.

US defensive tactics at the small-unit level were straightforward. The basic fundamentals of defense were essentially the same at each echelon, taking into consideration additional support assets at higher echelons. Troops were not positioned in continuous lines, but in small groups on key terrain. These were referred to as "holding garrisons," but this term eventually fell from use. Essentially each holding garrison or platoon position was a strongpoint. They defended the terrain features and the unoccupied ground (gaps) between the holding garrison's battle positions by observation and fire. Gaps may have been protected with obstacles including minefields and indirect artillery fire. They did not defend "lines" ("lines" mean mutually supporting defensive positions roughly abreast, according to the terrain). The main line of resistance (MLR) was an imaginary line along the forward edges of the most advanced defensive positions, essentially the forward defending rifle platoons and squads. When the enemy approached the MLR he was hit first by artillery fire, then cannon and mortar fire, and direct-fire infantry weapons including small arms, machine guns, and antitank (AT) weapons.

The two-echelon defense was essential in order to provide mutual support to the holding garrisons. The fire for each battle position was not only directed to the front, but across the fronts or flanks of other positions adjacent or further forward, plus covered gaps between positions. Battle positions were typically manned by a platoon with reinforcing crew-served weapons from company, battalion, and regiment. If a unit was assigned a wider than normal frontage or the terrain was broken or covered by dense vegetation, some rifle platoons might have been split with two squads manning one position and a single squad manning another. Both were reinforced by machine guns.

Defensive positions were not always established on the best available ground for observation and fire in order to conceal them and to surprise the enemy when he approached. This was a more important consideration than positioning weapons to achieve the longest possible range. Often the aim of a defense was to deny the enemy use of specific terrain, such as a hill. It was not always necessary to physically occupy the feature; depending on the terrain, a hill or bridge could be defended by occupying adjacent terrain from which the feature could be observed and covered by fire. Terrain features providing natural obstacles to tanks and infantry were incorporated into the defense when possible. Swamps, marshes, forests, rivers, streams, gullies, ravines, broken and extremely rocky ground halted or slowed tanks. Obstacles had to be covered by observation and fire to be effective.

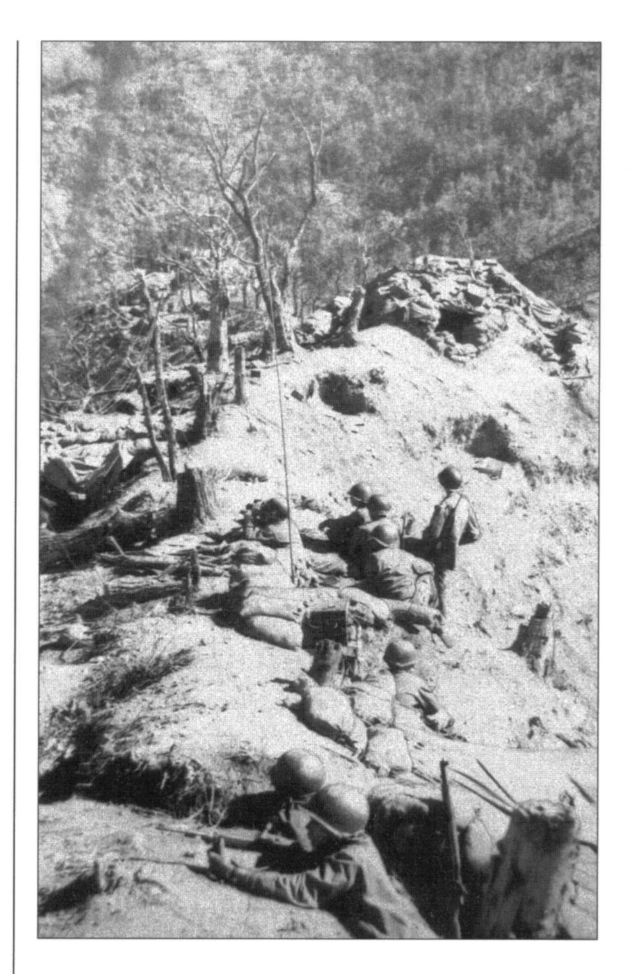
Beyond the MLR was the outpost line of resistance usually established by the regiment. During the Korean War this was designated the combat outpost line

(COPL). Units manning the COPL were detailed from the reserve battalion and a commander designated. A company or more might be employed for this mission. The outposts were usually placed beyond infantry weapon range and positioned where they could observe the most likely enemy avenues of approach (up to 4,000–6,000 yds forward of the MRL, dependent on terrain). The size of the outposts was determined by terrain, number of avenues of approach, and their mission—either to observe and report, or to engage and delay the enemy. Being beyond infantry weapon range they were usually of platoon strength. Their primary mission was to prevent surprise attacks and hamper enemy patrols. The outposts were concealed and only simple positions constructed. Few if any crew-served weapons accompanied the outposts, as they had to be able to withdraw quickly. Mortars and cannons supported them though. Once withdrawn they would re-occupy their reserve positions. Because of the proximity of the enemy such outposts were seldom established. If the regiment did not establish outposts, battalions and companies would establish smaller outposts on the outpost line of observation, of squad strength. These might be up to 400 yds forward and within range of infantry weapons on the MLR. Smaller observation posts and listening posts (OP/LP), comprising 3–5 men, could be established. The OPs were employed further out during the day to observe avenues of approach and at night moved closer to the MLR to serve as LPs. OP/LPs also covered gaps between positions and screened exposed flanks.

The regimental, battalion, and company (support platoon) reserve could be employed in a number of ways. (1) It could reinforce a forward position when it was determined the enemy main attack would fall there. (2) It could be employed as a counterattack force if a position was overrun. (3) It could relieve or reinforce a position under heavy attack. (4) It could remain in a second-line position to block an enemy penetration of the MLR or maneuver to another blocking position. (5) It could move to a position to secure an exposed flank. The reserve unit (support platoon) may have prepared second-line defensive positions on defendable terrain, but then the unit would be positioned in a defiladed area and simple positions dug for protection from artillery. Time permitting, the reserve company may have prepared two or more positions for each platoon in order to block different routes through the reserve area and protect the flanks. The reserve commander would reconnoiter routes to the different second-line positions and counterattack routes toward the forward positions.

High ground was always desirable for its observation advantages, extended fields of fire, and because it is harder to fight uphill. A rule of thumb was to position defenses on the "military crest," a line along the slope of a hill from which maximum observation up and down the slope can be obtained. However, if at all possible the positions were placed where they could observe and fire on the high ground's base. Positions were not to be established on or just below the topographic crest as they were silhouetted against the sky. In the desert even an elevation of a few feet would be an advantage. Natural terrain obstacles were tied into the defense whenever possible. The routes and directions of possible enemy attacks were determined and infantry and supporting weapons were designated to cover those approaches. The goal was to destroy or disrupt the attackers by concentrating all available fire before the enemy reached the MLR. Effective employment of the different weapons organic to a regiment was an art in itself as each had capabilities and limitations to be considered.

Camouflage and all-round local security was continuous during the development of defensives. Camouflage had to deny or limit the ability of the enemy to detect positions from the ground and air. Platoon positions were to be prepared for all-round defense, although limited time did not always allow this. A unit did not attempt to man a complete 360-degree perimeter. Riflemen and crew-served weapons were mostly oriented to the front with some on the flanks to cover gaps between positions. Time permitting, supplementary



These 24th Infantry Division positions in Korea are dug in along the crest of knife-edged ridges rather than lower down the slope on the military crest, as was doctrine. Such ridge-top positions were difficult to hit with artillery and mortars.

positions were prepared to fully defend the flank and rear of the position. Alternate emplacements were sometimes prepared for crew-served weapons. These covered the same sector of fire as the primary position if it became untenable. Supplementary positions covered other sectors, to the flank or rear for example.

Organization of the defense was accomplished by a number of control measures. The MLR and outpost lines have already been discussed. Boundaries were established between units at all echelons. This restricted movement and fire into adjacent unit sectors. A unit could send patrols or maneuver into or even fire into an adjacent unit's sector, but this had to be coordinated. Behind the two forward battalions a regimental reserve line (RRL) was designated. Behind the RRL was the reserve battalion and various regimental facilities to include the regimental command post (CP), aid station, ammunition supply point (ASP), service company, and CPs and rear elements of the AT and cannon companies. Contact points were designated on maps where unit boundaries crossed the MLR and RRL. It was here that commanders or their representatives would physically meet, terrain and situation permitting, to coordinate fire and observation. CPs, ASPs, and aid stations were also established in company and battalion areas. A rear regimental boundary delineated the regiment's rear area. Behind this was the divisional rear area, which included the reserve regiment, division artillery, attached and reinforcing artillery, and service support units and facilities.

The frontage of a given unit was dependent on terrain, visibility, available strength, supporting weapons, and just as importantly, the kind of force the enemy could commit. Subunit sectors on a given piece of terrain might not have been of the same width. A regiment, for example, may have assigned one battalion a narrow sector on a favorable enemy avenue of approach to allow it to concentrate its firepower, while the other battalion may have had a broader front as it offered a less favorable approach. In such cases units assigned the broader frontage had to be in a position in which the possible loss of ground would not threaten the defense as a whole. Units could be assigned a wider frontage when the enemy was forced to advance over exposed ground. Table 1 provides "standard" frontages. The 1941 frontages were for the square division with two brigades of two regiments each. The 1943 standard reflects the fact that units at all echelons had been increased in strength, had more crew-served weapons provided, and been issued the semi-automatic M1 Garand rifle.

Table 1: unit frontage (in yards)

Echelon	1941	1943
Squad	50–75	50–100
Platoon	100–200	200–400
Company	200–500	400–600
Battalion	500–1,000	800–1,500
Regiment	1,000–2,000	2,000–3,000
Brigade	4,000–6,000	–

The depth of defensive sectors depended on terrain and mission. Units required sufficient depth for second-line positions, reserves, space to maneuver within the sector, and for supporting rear facilities. Company and battalion sectors required sufficient depth to provide masking terrain, allowing mortars, AA weapons, and support facilities to be concealed in defilade. Table 2 shows how this depth varied.

Table 2: unit depth

Echelon	Depth in yards
Platoon	up to 200
Company	400–600
Battalion	700–1,200
Regiment	1,500–2,000

Special defensive principles

US defensive doctrine was fairly broad and allowed a great deal of latitude to accommodate all variables; manuals and doctrine were seen only as guidelines. Units tended to develop standard operating procedures for establishing defensive positions, reserve positions, and assembly areas. These routine actions often varied between units, even between regiments within the same division.

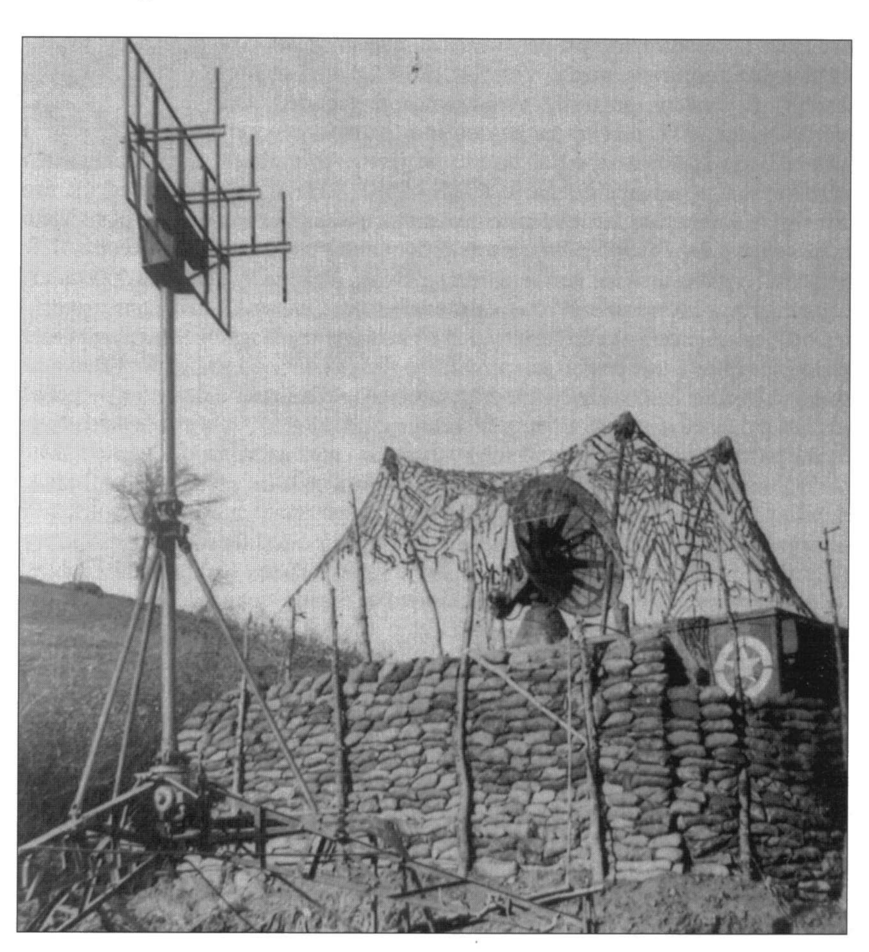
Infantry leaders first learned defensive tactics using a theoretical flat piece of model terrain, allowing the ideal doctrinal deployment of units, before progressing to more complex terrain and map exercises. The defense in woods or jungles required special considerations. Small wooded areas attracted artillery and were generally avoided. Large wooded areas provided cover, concealment, obstacles to tanks, and construction materials. The MLR was established well inside the tree line to protect it from observation and fire. No distance was specified for the location of the MLR as this depended on the density of vegetation and defendable terrain within the woods. Outposts were established on the wood line to warn of the enemy's approach, to direct mortar and artillery fire, and to hamper enemy patrols. To improve observation, fields of fire were cleared, but it was cautioned that these had to be only partly cleared, or else they would be avoided by the enemy. Gaps between units and areas providing cover and concealment to the enemy had to be identified and covered by fire. The flanks had to be protected and all-round defenses prepared to prevent encirclement. Enemy attacks would often follow roads and trails leading through the woods, which required a concentration of defenses. The cover and concealment afforded to the defender also presented problems. Artillery tree bursts made open-topped fighting positions more dangerous, and positions for artillery and mortars were often scarce. While doctrine called for the MLR to be defended by mutually supporting holding garrisons, the reality of jungle warfare in the Pacific demanded a drastic change. Because of the density of the terrain and Japanese tactics, the MLR often had to be a thin, continuous line of troops dug into fighting positions to prevent infiltration.

The defense of a stream or river allowed fewer troops to be deployed forward. Strongpoints were positioned to cover likely crossing sites, approaches to crossing sites, and suitable exit sites on the friendly shore. Reserves were maintained well to the rear to counterattack or block an enemy assault. Another reason for emplacing minimal forces on the river was to present fewer targets to enemy artillery. It was never assumed that a river or stream, unless vary large, was an obstacle to tanks. Water depth, bottom composition, the steepness of banks, and the obstruction capabilities of adjacent swamps and woods had to be considered.

The defense of a village was similar to that of a wood. In some instances it was more effective to place the MLR on defendable terrain outside the village. The buildings on the edge would receive the initial artillery fire making this a poor location. The MLR could be placed inside the village with outposts on the outskirts if suitable defensive positions were not available on the outside, but this might allow the enemy to gain a foothold in the outskirts, where it would be difficult to evict him. There were more positions for indirect fire weapons, especially outside the village to its rear. Defensive positions (fortified buildings) had to be prepared for all-round defense and positions located to prevent encirclement. Coordination with adjacent units was typically very difficult, and often subunits were forced to fight in near isolation.

It was sometimes preferable to establish defensive positions on reverse slopes of hills and ridges. This denied the enemy observation and direct fire on friendly positions. It also silhouetted an attacking enemy as he crested the high ground. Outposts and observation posts, to disrupt the enemy and call for indirect fire as he approached, were established on the forward slopes.

US forces seldom attacked at night, preferring to occupy defensive positions. Night defense offered a number of challenges. The ground immediately forward of the positions had to be studied and reconnoitered, weapons positions and sectors of fire assigned, supporting fire coordinated, ammunition and rations distributed, coordination made with adjacent units, positions dug, and obstacles and early warning devices installed. Preplanned artillery and mortar fire, illumination flares, and machine-gun final protective fire lines were essential. While LPs were specified for night defense, the tactical situation sometimes prohibited their use.



A great deal of effort was undertaken to protect critical equipment like this SRC-584 AA fire-control radar van. Only so much could be done to protect and camouflage antennae arrays though. A sandbag wall built this high was prone to collapse from a nearby artillery or bomb hit, or from heavy rain saturating the sandbags which would cause it collapse from the added weight.

Building and manning the defenses

The infantry was responsible for planning and constructing its own defenses including obstacles. Combat engineers when necessary provided *matériel* and technical assistance. Infantry leaders were trained to establish integrated defensive positions and the troops had ample opportunity to practice their establishment during field exercises. While a combat engineer company was habitually attached to an infantry regiment, it was mainly employed to maintain supply routes, make road repairs, and assist with obstacle and mine clearance. Other tasks permitting, it might have been able to aid in the construction of rear area facilities such as CPs, ASPs, communications centers, and other facilities requiring heavy construction.

Establishing the defense

This description will focus on the actions at company and platoon levels. The conditions of establishing a defense depended on one of three conditions listed here in their order of frequency: 1) When in contact with the enemy. 2) When the defensive position is established the unit is relieving a unit already occupying the position. 3) When the enemy is distant and time is available for constructing and organizing the position.

Depending on the situation the platoon leader, having received his orders, undertook the following actions. If the platoon was not already in the position to be defended it was moved there or concealed nearby. The platoon leader, sometimes accompanied by the platoon sergeant and/or the squad leaders, reconnoitered the position. The approaches available to the enemy were determined and their danger to the unit, as well as fields of fire identified, available cover and concealment, crew-served weapons positions, and where artillery and mortar concentrations should be plotted. The location of dead spaces (areas masked from observation and direct fire) were determined as were adjacent units' locations. Natural obstacles and how they could be tied into the defense were also selected.

The platoon leader then developed his plan based on his platoon's mission, enemy capabilities, information received from the company commander, and what was discovered via reconnaissance. He then issued an operation order to his squad leaders. As the position was developed the platoon leader issued further orders as necessary, refining the defense. Acting on the advice of crew leaders, he would designate crew-served weapons positions (primary, alternate, and supplementary). Guidance from the company commander also dictated the positions for some of these weapons to cover gaps between units.

The platoon's defensive mission assigned by the company commander covered the following:

- Trace of the MLR.
- Platoon area and sector of fire.
- Emplacements and sectors of fire of machine guns, and dead spaces in his sector.
- Instructions about the development of the position (camouflage, fighting positions, obstacles, clearing fields of fire, etc.).



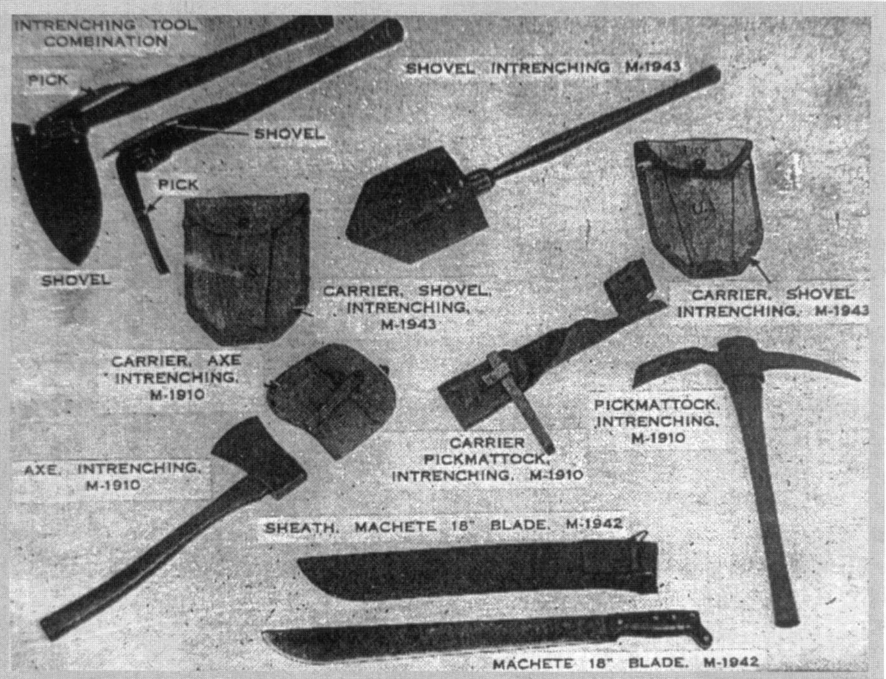
This 75mm M20 recoilless rifle position in Korea offers little protection and is poorly camouflaged. Sandbags protect the front, but there is no flank protection, making the position vulnerable to mortar fire. The straw bundles make it conspicuous against the snow. The lookout though has wisely positioned himself with a straw buddle behind him to prevent being silhouetted.

- Instructions about mortar, machine gun, and automatic rifle fire in support of company and battalion fire plans.
- Arrangements for mutual fire support with adjacent platoons.
- Emplacement and missions of supporting AT weapons.
- Planned artillery fire within the platoon sector.
- Information of the locations and activities of elements operating forward of the MLR.
- Conditions under which fire was to be commenced when the enemy attacked.
- Leaders who are authorized to call for final protective fire.
- Prearranged signals.
- Ammunition resupply.
- Location of the company CP, ASP, supply point, and aid station.
- Location and mission of the support platoon.

The position was occupied with the troops remaining concealed as much as possible. Noise and light discipline was maintained. Each squad moved into its position. The squad leader designated where each foxhole would be dug and indicated its sector of fire. He also assigned any alternate and supplementary positions and located the flanks of adjacent squads. Terrain to the front was observed or physically reconnoitered. Security outposts to prevent surprise attack and engage enemy patrols were established immediately, usually one or two depending on the terrain. The platoon CP was positioned where it could observe as much of the platoon's sector as possible, usually within one of the squad's positions. Field telephone lines were laid from each squad to the platoon CP which itself was linked to the company CP. One of the platoon's two runners reported to the company CP to await transmitting orders. Camouflage and security were continuous throughout the process. Time and resources permitting, obstacles and early warning devices (trip flares, rattle traps) were established to the front and tied into adjacent units. Barbed wire obstacles were positioned within 50–100 yds of the MLR and outside of hand grenade range to prevent stalled attackers from grenading forward positions.

Infantry entrenching tools

Infantrymen were provided with one of five hand tools; most carried the entrenching tool or "e-tool," a small shovel. There were three types of e-tools. 1) The M1910 had a non-folding blade and a T-handle. 2) The M1943 had a folding blade that could be positioned as a normal shovel or locked at a 90-degree angle for hacking. It was copied from a German design and began replacing the M1910 in March 1944. 3) The combination e-tool was adopted after the war, and was used in Korea along with the M1943. It was identical to the M1943, but had a folding pick. Some men carried an M1910 pick-mattock with a detachable head for easier carrying. Others carried an M1910 axe, actually a small hatchet. Selected soldiers carried the very effective M1938 wire cutters. In tropical areas the 18in.-long M1942 machete was issued. Web canvas carriers that could be attached to the belt or pack were provided for each tool. A rifle squad normally carried seven e-tools, two pick-mattocks, two wire cutters, and one axe.



During the development of the defense it was often necessary for Browning automatic rifles (BAR), machine guns, and other crew-served weapons to be repositioned to cover gaps, dead spaces, and support adjacent units. The squad's BAR could be positioned in the center of the squad's position or near a flank, where it would cover as much of the squad's front as possible. Marine squads had two and later three BARs and they were evenly distributed across the squad front with overlapping fire sectors.

The company's support platoon occupied its position in much the same manner as the forward platoons. It might have prepared a position from which to support one or both of the forward platoons, block a possible enemy avenue through the company sector, or prepare two or more positions to block different avenues or secure the flanks. The platoon may have occupied one of these positions or was placed in defilade for further protection and was prepared to react to different contingencies. The platoon leader selected and reconnoitered routes between the different positions as well as counterattack routes toward the forward positions. The support platoon could also be tasked to establish security outposts forward of the MLR.

The number of light machine guns (LMG) assigned to company weapons platoons varied. Heavy machine guns (HMG) provided the core of defensive fire. These watercooled weapons could maintain a sustained rate of highly accurate fire to long ranges and were positioned to place final protective fire across the company front. HMGs were usually positioned in pairs to cover the same sector, although some distance could separate the two guns.

Bazookas, available from late 1943, were positioned to cover armor avenues of approach. Bazookas did not have dedicated crews; selected riflemen operated them. Two to four 37mm (57mm from late 1943) AT guns from battalion or regiment might be positioned in a company's sector. Even though some may have been emplaced within a platoon's sector, they still may have been under company or battalion control. Some AT guns and bazookas may have been assigned to the support platoon to cover armor routes through the depth of the company sector, support counterattacks, or to cover gaps between forward platoons.

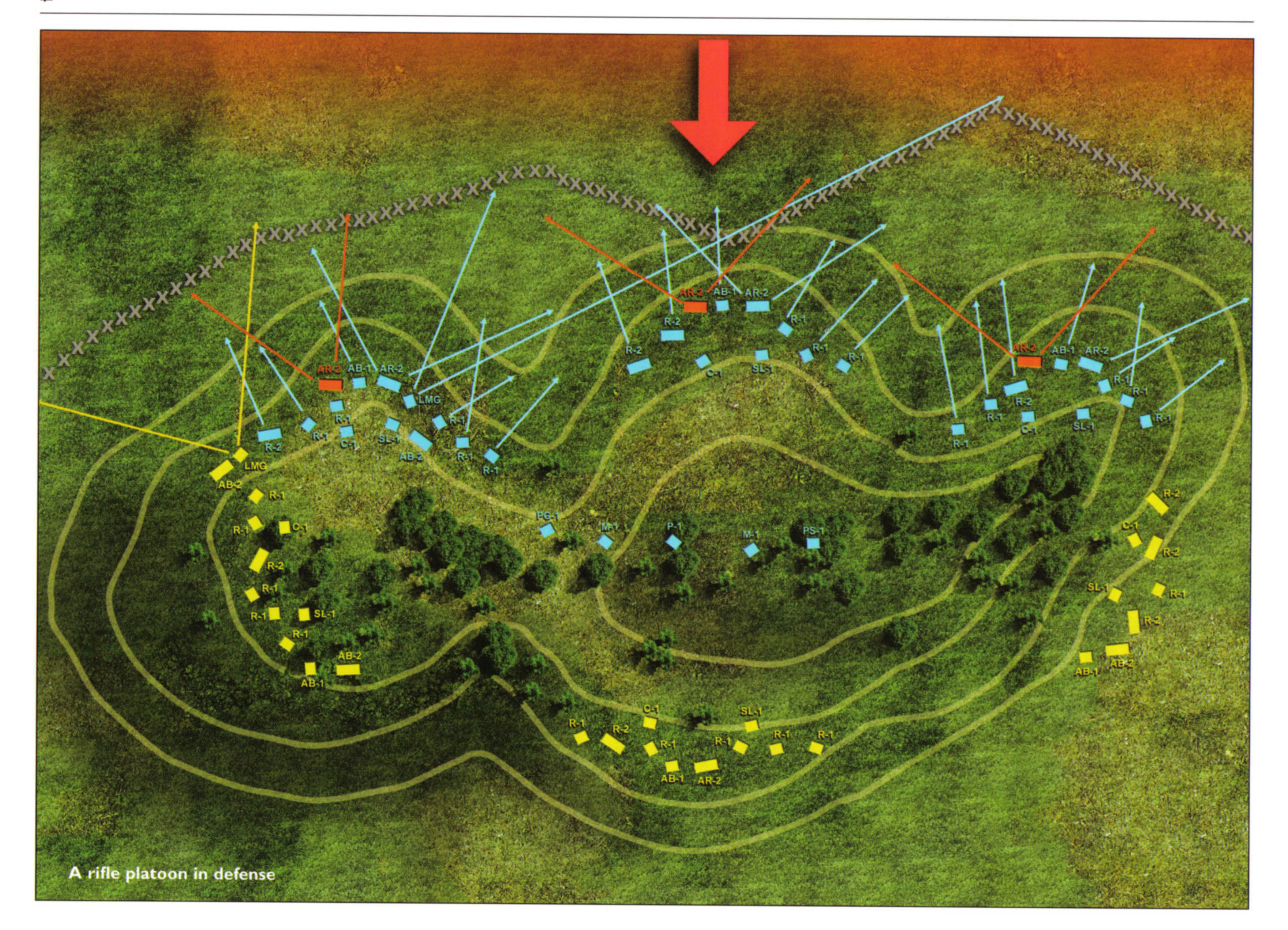
Tanks and tank destroyers were often attached to rifle companies, especially later in the war. Besides providing mobile AT fire, they served as assault guns providing direct fire support. Often tanks and tank destroyers were held in the company or battalion rear to conceal their presence, allow them to maneuver to the point where the enemy attack was aimed, engage enemy armor that may have broken through, or support or conduct a counterattack. Doctrine called for tank destroyer units to be held in the rear in central locations. In the event of a large-scale enemy attack they would move to the area of the breakthrough. Self-propelled tank destroyers would conduct counterattacks while towed tank destroyer units would establish blocking positions on the enemy attack route and on the attack's flanks. In practice this seldom occurred. Rarely were the Germans able to launch massed armor attacks. They more commonly employed tanks and assault guns in company and smaller-size local counterattacks. For this reason tank destroyer and even tank units were often parceled out in sections (two or three tanks/tank destroyers) or platoons (four or five tanks/tank destroyers). There were even instances where tanks and tank destroyers were attached as single vehicles down to rifle platoon level. Doctrine called for armor to operate at least in pairs for mutual protection. In the rare instances where the Germans were able to launch large-scale armor attacks, such as the Ardennes, the scattered tank destroyer units were unable to mass together, causing difficulties.

Rifle companies had three 60mm mortars and these were grouped immediately behind the support platoon. Concentrations in front of the forward platoons and to cover gaps would be plotted. In theory a 60mm mortar could be attached to each rifle platoon, but this seldom occurred, as it was more effective to concentrate them under centralized fire control. The battalion

Infantry Entrenching Equipment Set No. 2

The infantry battalion headquarters company's 27-man ammunition and pioneer platoon was issued the following set of full-sized hand tools, along with its own set of pioneer tools. The tools were carried in large wooden boxes and transported in the platoon's 2.5-ton cargo truck. The tools could be loaned to rifle companies to increase their field fortification and obstacle construction capabilities. The set contained:

- 250 D-handle shovels
- 125 pick-mattocks
- 26 single-bit axes
- 13 handsaws
- 13 one-man 3ft crosscut saws
- 9 wire cutters
- Four 56in.-long crowbars
- 2 mauls (heavy wooden mallets)
- Spare shovel, pick, and axe handles
- Files and saw-sharpening tools
- 200 lbs of nails, 6 rolls of white cloth marking tape, and 500 sandbags



A rifle platoon in defense

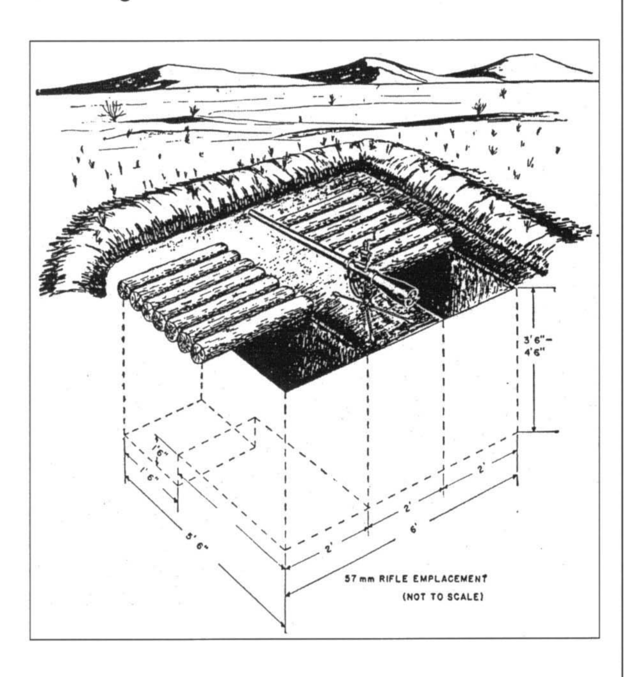
LEFT This rifle platoon position is located on a low hill with its three rifle squads each positioned on a spur. Riflemen cover the draws while each squad's BAR (shown in red) covers the nose of the spur. Normally BARs were positioned to cover the entire squad frontage, but the terrain prevents this. An alternate BAR position is located near to its primary one. Many of the foxholes are one-man, but later in the war two-man foxholes were more common. A light machine gun is attached from the company weapons platoon and is emplaced in the left squad's area to cover the draw separating it from the center, the squad's spur, and the right draw. A supplementary machine-gun position (in yellow) is located on the left flank. The platoon headquarters personnel are positioned along the crest, among the trees. Supplementary squad positions (shown in yellow) are located to protect the platoon's flanks and rear. Protective barbed wire crosses the platoon's front with the machine gun sighted to provide final protective fire along part of it. The enemy's direction of attack is indicated by the red arrow.

Key:

-1	one-man foxhole
-2	two-man foxhole
P	Platoon Leader
PS	Platoon Sergeant
PG	Platoon Guide
M	Messenger
R	Riflemen
C	Corporal, Assistant Squad Leader
SL	Sergeant, Squad Leader
AR	Automatic Rifleman, Assistant Automatic Rifleman
AB	Ammunition Bearer
LMG	Light Machine Gun

81mm mortar platoon was most effective when positioned together for concentrated fire, but the platoon's two or three two-tube sections could be dispersed if the battalion front was wide, or to provide more protection for enemy counterbattery fire. 81mm mortars were commonly emplaced behind the reserve company, but usually no more than 800 yds behind the MLR. Depending on the depth of the defense and the availability of suitable firing positions the mortars could be forward of the reserve company. Both 60mm and 81mm mortars contributed greatly to the night defense by firing illumination flares.

The armament of regimental cannon companies varied, but the six or eight guns were usually located well to the rear and behind the reserve battalion. They were sometimes integrated into the division artillery. This was especially true of towed cannons. Some units were equipped with self-propelled howitzers though, and might employ them further forward for direct support or as AT weapons. They were also employed as mobile reserves and counterattack forces. Infantry troops, in concealed fighting positions on the MLR, preferred armor to remain in the rear, as it tended to draw fire.



ABOVE This is a two-foxhole type recoilless rifle emplacement. Intended for the 57mm M18A1, it could accommodate the 75mm M20 (pictured here, not to scale). The overhead log cover could be waterproofed using flattened cardboard ration boxes covered with earth.

The extent to which platoon positions were developed depended on how long the position was occupied, the enemy situation, the nature of the threat, and the availability of construction and obstacle materials. A company remaining in a position for five or so days could develop a formidable defense. More often, defenses were occupied for limited periods, often just overnight, and the advance resumed the next day. It was not uncommon though for units to remain in defensive positions for a few days as forces consolidated, resupplied, maintained vehicles, or conducted holding actions while other units advanced or adjusted their lines.

The company commander assigned frontages to his rifle platoons according to the terrain's natural defensive strength and relative importance of the defended area. If a platoon occupied an area offering poor observation and fields of fire, such as heavily forested or broken ground, the frontage might not exceed 300 yds. If the area was more open, providing longer fields of fire and good observation, a frontage up to 750 yds might be assigned. On flat open terrain, such as deserts, plains, or a broad bare ridge side, or if an obstacle across

the front (such as a river, stream, ravine, swamp, or AT ditch) made it difficult for an enemy to attack in strength, the frontage may have exceeded 750 yds.

The frontage physically occupied by the platoon was determined by the intervals between fighting positions. This too depended on terrain, vegetation, obstacles, and fields of observation and fire. In close terrain the interval between one-man foxholes might be 5 yds, and 10 yds between two-man foxholes. In open terrain one-man foxholes might be at 10-yd intervals and two-man as much as 20 yds apart. Under normal situations an interval up to 25 yds was allowed for each crew-served weapon in the platoon sector. This might include one or two LMGs, one or two HMGs, an AT gun, and a bazooka manned by riflemen. The platoon covered its sector as well as gaps between adjacent units. Detailed coordination was made between adjacent units on either flank to ensure who was covering gaps and with which types of fire. The purpose of enemy patrols and probing was to determine the locations of fighting positions, especially crew-served weapons, and gaps between units.

It is emphasized that procedures varied greatly depending on the tactical situation and terrain. How defenses were established and conducted in Europe, Italy, on Pacific islands, and in other areas depended on unique aspects affecting the conduct of the defense.

Conduct of the defense

A unit was assigned a sector to defend based on terrain, vegetation, enemy forces, unit capabilities (most would be understrength and short of crew-served weapons), and availability of reserves and supporting fire.

Outposts and patrols warned of the enemy's approach. Of course in situations where the enemy was in close proximity to the MLR it might not be possible to establish outposts except just forward of the line. Artillery and mortars would fire on advancing enemy troops when detected. When an attack was deemed likely, possible assembly areas, movement routes, and attack positions would be fired on. At night, illumination forward of the MLR might be called for when enemy movement was detected or suspected. In the Pacific it was common for illumination to be near continuous through the night because of never-ending Japanese probes and harassing attacks. In Europe American troops on night defensive positions had to deal with roaming patrols, snipers, long-range machine gun fire, and mortar fire.

It was soon realized that attacking infantry did not rush across what was previously thought of as "infantry terrain," but approached and attacked out of rough and densely vegetated terrain. The defenders' fields of observation and fire were restricted here, but this was where the densest defenses had to be established. Tanks too would not necessarily attack across the most open ground. Rolling terrain with scattered vegetation to provide concealment was preferred so as not to expose themselves to long-range AT fire.

The attackers were normally taken under fire by the appropriate weapons when they came within range. Fire was not held until the attackers were within optimum range. This served to inflict casualties early, break-up formations, disorganize, and confuse the enemy. Regimental cannons, AT guns, 81mm mortars, and HMGs would open fire at long range. AT guns were provided high-explosive rounds, effective against personnel, though they were little used in this manner. The HMGs were especially effective being able to place sustained,

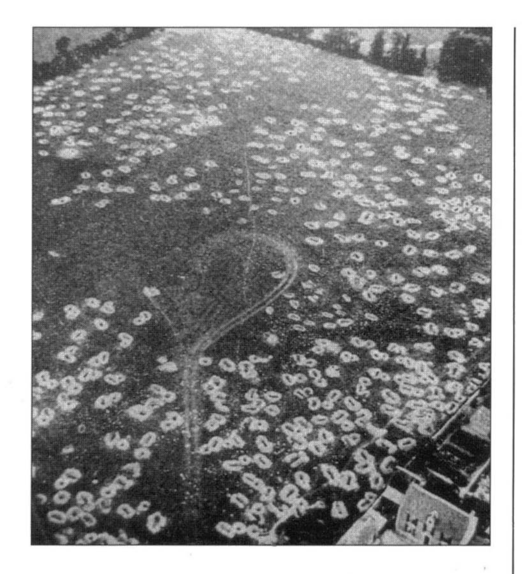
A commonly encountered field fortification was the 81mm mortar position and ammunition pit emplaced in a shell crater. Even if a mortar or artillery piece remained in a position for only a short time, the difficulty of camouflaging the emplacement was increased by the presence of ammunition stores, spent cartridges, containers, and packing materials.



concentrated fire on groups of infantry at up to 1,800 yds direct fire and 3,000 yds indirect. LMGs had an effective range of 1,800 yds and BARs 600 yds. It was a different matter with enemy tanks though. While AT guns could hit a tank at a long range, it might not do any damage. They would often wait until an optimum range insured both a precise hit and penetration. This varied from 400 to 600 yds.

Infantrymen might open fire at longer ranges, but seldom were the enemy sufficiently exposed. Rifle, BAR, LMG, and 60mm mortars seldom were able to engage the attackers at over 300 yds, often less. If the enemy were able to close with the defenders and get among the defensive positions, close-range small-arms fire, grenade, bayonet, and hand-to-hand combat would ensue. Before this occurred a well-coordinated defense was able to engage the enemy with prearranged final protective fire with machine guns firing near continuous bursts on fixed lines of fire crisscrossing the unit's front. Machine guns in the rear would engage with plunging overhead fire into dead spaces or firing through gaps between forward platoons. Bazookas were virtually last-ditch weapons for defense against armor with their optimum range being about 100 yds. They were sometimes positioned to allow them to engage tanks from the flanks or rear as they passed through the defenses. The bazooka's mobility allowed soldiers to aggressively follow tanks that broke through to hunt them down. 60mm and 81mm mortars as well as artillery would fire pre-planned concentrations across the front and on gaps. Pyrotechnic signals were usually employed to call for final protective fire.

If the forward positions were penetrated the commander would begin to maneuver the support platoon and other reserves into position to conduct a counterattack or block a possible penetration. Units adjacent to the penetration thickened their flanks and positioned their reserves to contain it. Reserves were seldom employed to close a gap by throwing troops across it. The delivery of a vigorous counterattack supported by coordinated fire, preferably from the flank(s), was more effective. Artillery was usually emplaced approximately one-third its maximum effective range behind the main battle line. This helped protect it from



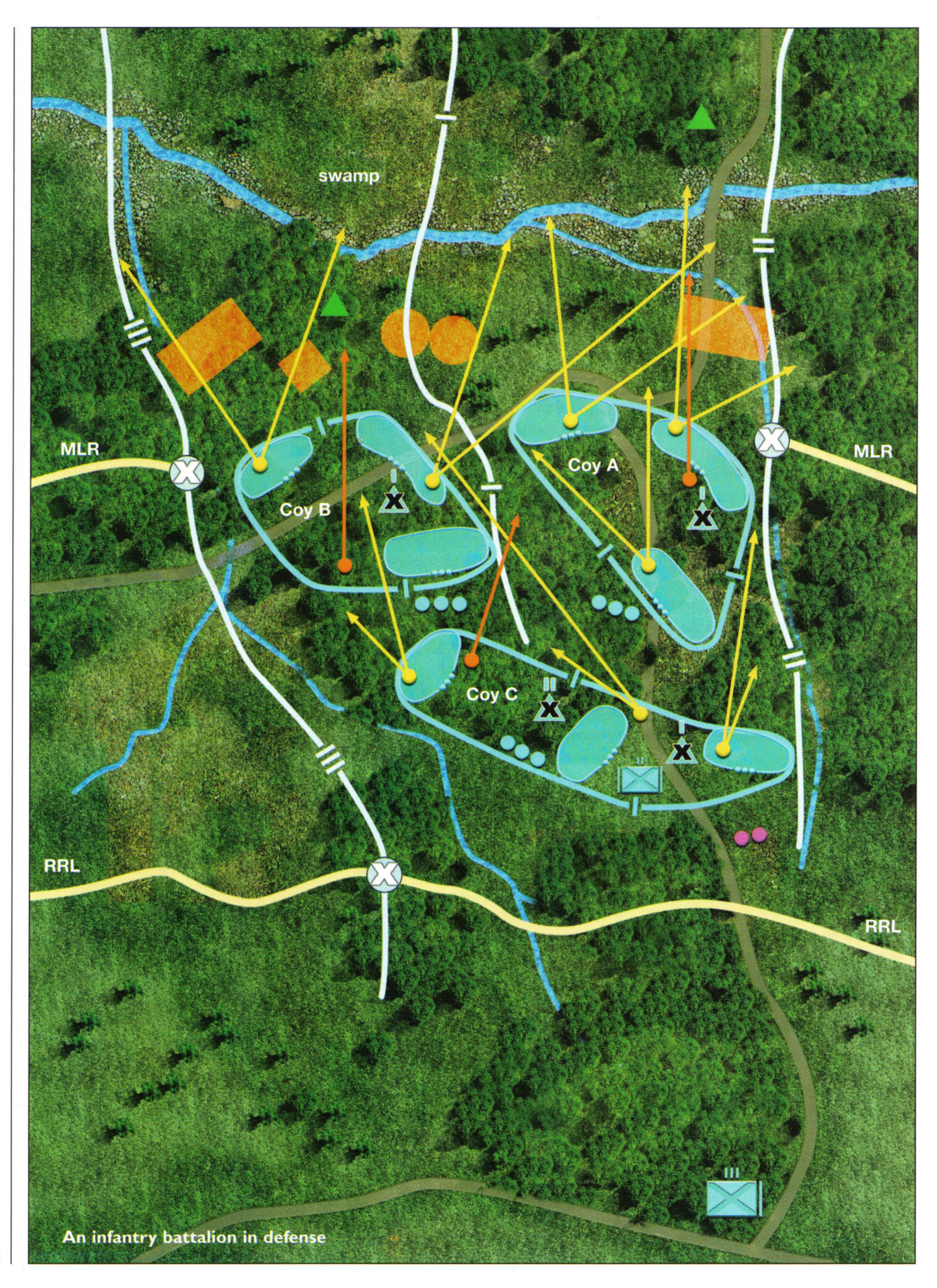
Units were supposed to fill their holes when moving on, but time did not always permit this. Sometimes the holes would be left for following units. This manor field in France appears to have been used as a battalion bivouac area. Obviously the threat of enemy air attack was not of concern at this time.

Field artillery

Army divisions possessed three battalions of 105mm howitzers and one with 155mm howitzers. Marine divisions had two 75mm and two 105mm howitzer battalions, although this varied at different times. The Marines adopted the same allocation of artillery as the Army prior to the Korean War. 155mm howitzer and gun battalions were corps-level artillery. 4.2in. mortars were provided by non-divisional assets as well and were not used by the Marines until the Korean War. These same weapons were used in both World War II and the Korean War, although the mortars began to be replaced by improved designs during the Korean War.

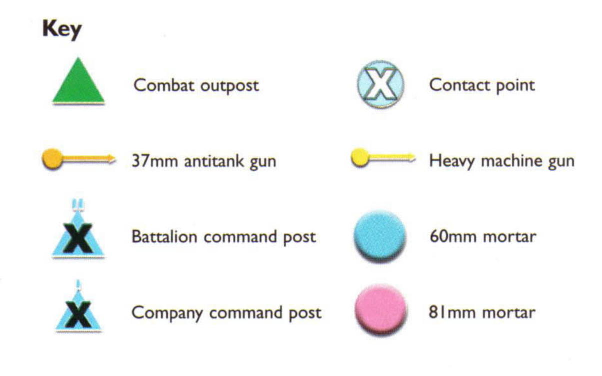
Artillery/mortar	Max. effective range (yds)	Rate of fire (rounds per min)
75mm M1A1 pack howitzer	9,610	6 rpm
105mm M3 pack howitzer	8,295	15 rpm
105mm M2A1 howitzer	12,300	2–4 rpm
155mm M1A1 howitzer	12,700	1–3 rpm
155mm M1A1 gun	25,715	1–3 rpm
60mm M2 mortar	1,985	18 rpm
81mm M1 mortar	3,390	10 rpm
4.2in. M2 chemical mortar	4,400	8 rpm





An infantry battalion in defense

LEFT This infantry battalion is deployed with its companies A and B on the main line of resistance (MLR) and Company C in reserve (individual platoon positions are also ringed within these company areas). Both 37mm antitank guns and heavy machine guns are deployed in depth. Light machine guns are not shown, but the two in each company sector would cover the gaps between the HMG fields of fire. Note the wide gap left uncovered by the HMGs in the swamp area in the upper part of the illustration—artillery and mortars cover this unlikely avenue of infantry approach. The barrage areas are shown in orange shading. The RRL is also shown, indicating the Regimental Reserve Line.



detection by enemy observers and infiltrating patrols plus allowed it sufficient time to withdraw in the event of a breakthrough.

AA weapons, when protecting forward troops, were usually emplaced several hundred yards behind the area to be protected. This allowed it to engage enemy aircraft as they approached the protected target and while over it. Positioning AA guns within the protected area reduced their angle of fire and the time they had to engage fleeting targets. It also placed them within the target area.

Near the MLR, AA units were positioned behind masking terrain if possible to reduce their vulnerability to artillery fire and detection by observers. When the threat of enemy air attack was low it was common practice to employ light AA weapons (.50-cal, 20mm, 40mm) near the MLR to provide direct fire on ground targets. 90mm AA guns were sometimes provided indirect fire against ground targets under the control of division artillery.

In Korea man-portable flamethrowers were sometimes placed in forward positions. They were not effective in the defense, mainly because of their short range (50 yds) and short duration burn-time (8–10 seconds). Their greatest value was their psychological effect. Command-detonated flame mines were also used in Korea. These were 5- or 20-gallon drums emplaced in angled holes in rows on hillsides and called *"fougasse."* They were filled with thickened gasoline and electrically detonated to blast a fireball into the attacking troops.

Defensive firepower

US Army and Marine infantry were well-structured and balanced units with a complete range of support weapons allocated to all echelons. In World War II there were insufficient AT weapons, but attempts were made to improve them throughout the war. Subunits at all echelons were triangularly organized and most support weapons were allocated to provide one weapon or a pair of weapons to each subordinate echelon.

While the US Army was oriented toward mobile offensive warfare, the infantry regiments, comprising the bulk of the combat power, were still largely foot mobile. Small numbers of trucks were provided to haul supplies and equipment. The regimental headquarters, AT, cannon, and service companies, and battalion headquarter companies were at least partly if not wholly truck-mounted. The regiment's nine rifle companies had only one or two 0.25-ton jeeps in the weapons platoon (none in the HQ) and the battalion heavy weapon companies had about 18 jeeps to haul crew-served weapons and ammunition. Marine regiments were similarly lightly motorized, often with fewer vehicles because of their amphibious mission.

Army and Marine regiments on the surface had a similar organization, although there were significant differences in subunit structure and the allocation of weapons. The basic World War II organization of infantry regiments is provided in the table on page 20.

Army	Marine Corps
Regimental HQ Company	Regimental HQ and Service Company
Infantry Battalion (× 3) *Battalion Headquarters Company* *Rifle Company (× 3)* *Heavy Weapons Company*	Infantry Battalion (× 3) *Battalion Headquarters Company* *Rifle Company (× 3)* *Weapons Company (eliminated 1944)*
Regimental AT Company	Regimental Weapons Company
Regimental Cannon Company	–
Regimental Service Company	– (part of HQ&S company)
Regimental Medical Detachment	– (part of HQ&S company)

The Army infantry regiment changed little during the war. Strength figures changed little from around the 3,250 mark. Infantry battalions had approximately 870 troops. The 120-man battalion headquarters company had battalion and company HQs, a battalion HQ section to support the staff, ammunition and pioneer, communications, and AT platoons, the latter with three 37mm guns. The 190-man rifle companies had an HQ, three rifle platoons of three squads each with a BAR, and a weapons platoon with a machine gun section with three LMGs plus a mortar section with three 60mms. The 160-man heavy weapons company had two machine gun platoons each with four HMGs and a mortar platoon with six 81mms. The 160-man regimental AT company had an AT mine platoon and three AT platoons with three 37mm or 57mm guns each. The 115-man regimental cannon company was initially equipped with six 75mm guns and two 105mm howitzers, all halftrack-mounted. This was changed in 1943 before most regiments received the equipment and they were assigned six 105mm M3 pack howitzers in three platoons. Even then it was not uncommon for regiments to deploy without having received their cannon companies. Armament varied greatly over time with some divisions receiving different weapons. Among

BELOW An M15A1 motor gun carriage, a halftrack mounting a 37mm and twin .50-cal. machine guns, provides air defense in a rear area from its camouflaged partly dug-in emplacement.

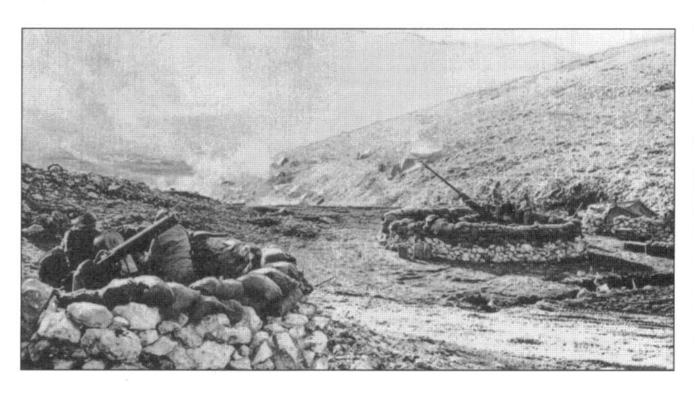




RIGHT This still-uncamouflaged position accommodates a .50-cal. M2 machine gun on an M63 AA mount. The gun is fitted with a 200-round magazine. An artillery battery was provided with two .50-cal. guns for protection against low-flying aircraft and for ground defense. The M3 tripod was provided for the latter role. The M63 mount could also be used to engage ground targets, but was less stable than the M3 for that purpose.

these were 75mm M3 halftrack-mounted guns and full-tracked 75mm M8 and 105mm M7 howitzers.

The Marine regiment went through a number of changes seeing the reallocation of crew-served weapons. Regimental strength varied from 3,240 to 3,400 depending on the period. Infantry battalions had a strength of 820–1,000. Battalion HQ companies varied from 140 to 270. The 200–240-man rifle companies had three rifle platoons of three squads and a weapons platoon with two LMGs and three 60mm mortars. The LMGs were increased to three in 1943. The weapons platoon was eliminated in early 1944 with the mortar section reassigned to the company HQ and the machine gun section expanded to a platoon with six LMGs (later eight), and six reserve HMGs. At this same time rifle squads were enlarged and provided with three BARs instead of one. The 230-man battalion weapons company had three machine gun platoons with four HMGs each, a mortar platoon with four 81mms, and an AT platoon with three 37 mms. This company was eliminated in early 1944 with the mortar platoon reassigned to the HQ company and the machine gun platoons absorbed into the rifle company machine gun platoons. The 37mms were eliminated at battalion level. The 200-man regimental weapons company had three AT platoons each with three 37mm guns and a platoon of two halftrack-mounted 75mm M3 guns. In 1944 the 75mms were increased to four and then replaced by four 105mm M7 SP howitzers.



In the foreground is a .50-cal. M2 watercooled machine gun and behind it a 40mm M1 Bofors AA gun of an AAA automatic weapons battalion. Both sangar-type positions are constructed of rock parapets topped by sandbags for protection against flying rock fragments. To the right of the 40mm position is a trash pit for ammunition boxes and packing residue. Behind the position are rock-walled crew quarters, topped by a tent.

Between World War II and Korea both Army and Marine regiments underwent significant changes in weapons as well as some internal organizational changes. Army regimental strength varied from 3,500 to 3,800 during the Korean War, infantry battalions from 860 to 930, with rifle companies around the 200 mark. The major change was the conversion of the

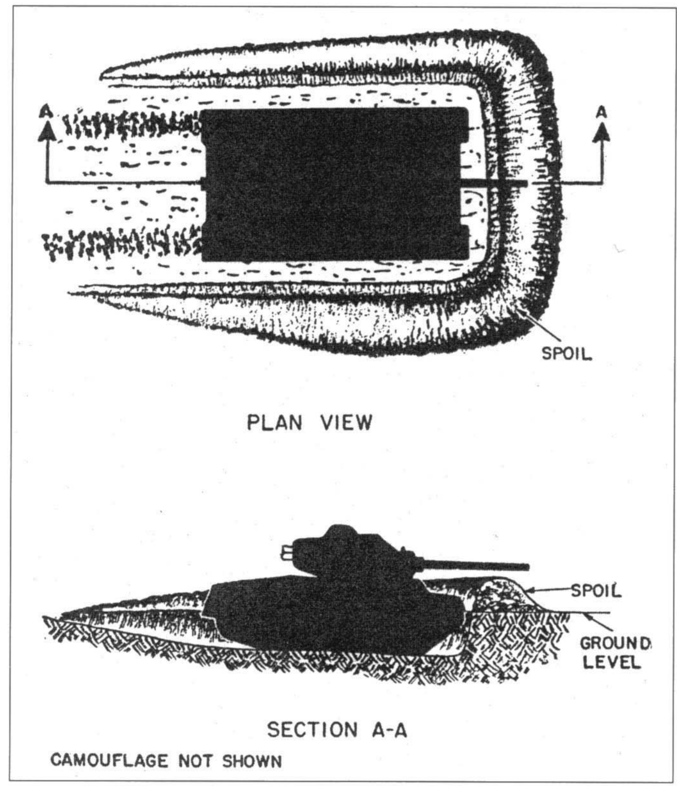
Antitank weapons

Both the Army and Marine Corps began the war with the already obsolete 37mm AT gun as the main battalion- and regimental-level AT weapon. It began to be replaced by the 57mm in July 1943, but many units retained the 37mm at battalion level, and the Marines and most Army units in the Pacific did not use the 57mm. The 3in. AT gun began to be issued to towed tank destroyer units in early 1943. The 75mm halftrack-mounted AT gun was employed in Marine Corps regimental weapons companies and Army regimental cannon companies, although these were later replaced by various full-tracked assault guns. The bazooka provided infantrymen with an effective, man-portable AT weapon for the first time. Recoilless rifles were introduced at the end of Word War II, but saw little use. They were widely used during the Korean War.

Antitank weapon	Effective range (yds)	Rate of fire (rounds per minute)
37mm M3A1 AT gun	1,000	15–20 rpm
57mm M1 AT gun	900	12–15 rpm
3in. M5 AT gun	1,200	12 rpm
75mm M3A1 SP AT gun	1,200	3–6 rpm
2.36in. M1, M1A1 bazookas	250	4–5 rpm
2.36in. M9, M9A1 bazookas	300	10 rpm
3.5in. M20 bazooka	300	6 rpm
57mm M18A1 RR	1,400	10 rpm
75mm M20 RR	1,200	10 rpm
105mm M27 RR	1,200	10 rpm

RIGHT Emplaced atop a Korean ridge, this half-tracked M16A1 motor gun carriage mounts a .50-cal. M55 quad machine gun. Although capable of a rate of fire of almost 2,000 rounds per minute with all four guns, usually only two guns were fired simultaneously. It was an excellent weapon for breaking up human-wave attacks and providing suppressive fire on enemy-occupied hills and ridges. An infantry division's AAA battalion possessed 32 of these weapons along with 32 twin 40mm M19 self-propelled AA guns, with four of each in its four batteries.





ABOVE A self-propelled weapon emplacement, often called a "tank slot," provided "hull defilade" for the vehicle—that is, the hull was protected by the excavation and parapet while leaving the turret or weapon mounting exposed in order to employ the weapon. "Turret defilade" meant that the entire vehicle was under cover.

AT company to a tank company with 22 tanks (models varied) in four five-tank platoons, and the cannon company was converted to heavy mortar with three platoons of four 4.2in. mortars. In the heavy weapons company the 57mm AT guns were replaced by four 75mm recoilless rifles (RR), the mortar platoon was reduced to four 81mms, and a single machine gun platoon remained with four HMGs and four LMGs. Four 105mm RRs were added to the AT platoon in late 1952 with two 75mm RRs retained. Rifle companies had three rifle platoons of three squads, each with a BAR plus a weapons squad with an LMG and two 3.5in. bazookas. In 1952 the weapons squads received a second LMG and the bazookas were placed in the platoon HQs. A second BAR was authorized to rifle squads in early 1953 although many already had a second. The weapons platoon had a special weapons section of three 57mm RRs and a mortar section of three 60mms.

The Marine regiment numbered 3,900 troops with three 1,120-man battalions. The weapons company was restored with a mortar platoon with four 81mms and two platoons with four HMGs. The rifle company's platoons remained the same and the mortar section with three 60mm mortars remained in the company HQ. The machine gun platoon had six LMGs with a section of two normally attached to each rifle platoon. The regimental 280-man mortar company had twelve 4.2in. mortars while the 140-man AT company had three platoons each with four 75mm RRs and a platoon of five medium tanks.

Construction materials

American soldiers made extensive use of the local materials to construct field fortifications and obstacles. Local materials were dependent on the area of operations with some offering abundant supplies, such as in Northwest Europe, Italy, and the Pacific islands, while such materials were scare in North Africa. Most field fortifications were designed to use a minimum of materials. Revetting materials (to reinforce the sides of positions) and overhead cover materials and their supports were the most important ones.

Issue sandbags were usually made of coarse tan burlap. Empty sandbags measured 14in. × 26.5in. and had a length of tie-string tacked 3in. from the opening. The bags were made from a single piece of cloth, folded, and sewn across the bottom and one side. Locally acquired cloth feed and grain bags, usually larger than standard sandbags, were used as well. Sandbags were three-quarters filled and tied closed with a square knot. A filled bag weighed from 40 to 75 lb depending on the soil and its moisture content. The average weight with dry sand was 65 lb. A filled bag measured approximately 4.75in. × 10in. × 19in. For prolonged use it was recommended that the filler soil be mixed with cement or bitumen (a thick, sticky petroleum oil used for surfacing roads). Once wetted, the bags hardened to provide a fairly solid and stable revetment or parapet. Ordinary sandbags began to deteriorate after a month. Two layers of sandbags provided protection from small arms and fragments.

Timber was abundant in Europe and the Pacific. Engineer units often set up portable saw mills to provide dimensioned lumber. Lumber and mill-cut logs were seldom available to combat troops though. They cut their own logs, though axes and saws were in short supply. The minimum diameter of logs for overhead cover on small emplacements was 4in. while 6in. was necessary for larger emplacements and preferred for even small emplacements. 6in.-diameter logs were recommended for horizontal beams (stringers) and vertical support posts. For very large emplacements 8in.-diameter logs were recommended with similar or larger logs for stringers and vertical posts.

Sawed, dimensioned timbers used as stringers could be smaller than the required diameter round log as they were more resistant to bending. For example, a 2in. × 4in. timber was equivalent to a 4in-diameter log for horizontal support while a 3in. × 10in. timber was equivalent to an 8in. log. Round timbers resisted vertical shear better than the equivalent sawed timbers and were preferred for vertical supports. Railroad rails and wood, concrete, and steel ties were sometimes used for field fortifications, especially for supporting overhead cover.

Revetting materials were essential for protecting the sides of emplacements and trenches from weather and wear by occupation, and preventing them from collapsing from near hits and heavy rain. Retaining wall-type revetments were built using sandbags, sod, or

Safe thickness of material

The Army used its own .30-cal. 174-grain M1 ball ammunition for rifles, BARs, and machine guns to establish the penetration and minimal safe thickness of typical field fortification construction materials. The .30-cal. round was slightly more powerful than the German 7.92mm, Japanese 7.7mm, and Communist 7.62mm. The thickness of the following materials is in inches. The test-range firing was set at 200 yds.

Material	Max. penetration	Safe thickness
Armor plate	0.3*	0.5
Concrete (plain)	2	3
Brick masonry	5†	7
Gravel	8	10
Dry sand	12	14
Moist sand	14	18
Solid oak	20	24
Earth loam	30	36
Greasy clay	60#	72

* .30-cal. armor-piercing bullet penetrated 0.62in.
† Greater penetration achieved through softer mortar.
Varies greatly depending on consistency. This is the maximum.

earth-filled containers. For facing revetments burlap or oznaburg (hemp) and chicken wire, wire mesh, or steel mesh were used along with corrugated steel or planks. The revetting material was held in place with 3in.-diameter posts, steel barbed wire pickets, or pipe. Brushwood (tree saplings) of less than 1in. diameter at the butt end, or 2–3in.-diameter logs were also used.

All types of munitions were shipped in robust wooden boxes and crates of all sizes. They typically had a hinged lid secured by a locking latch and rope carrying handles on both ends. These were filled with earth and stacked brick-like to form interior walls and for parapet revetting. Logs, timbers, or pickets braced them to prevent their collapse. Boxes were also disassembled and the broads used to construct firing ports, doors, shelves, and the like. Steel fuel and oil drums could be filled with earth and used for gun emplacements although they were supposed to be returned.

Corrugated steel arches were provided for small shelters, usually found in rear areas. They could shelter troops, supplies and CPs. These were semi-circular plates normally used to construct drainage culvert pipes. The small size was a single arched plate 2ft in length, allowing any number to be assembled end-to-end, and 4ft 2.37in. across the base. The large size was assembled from sectionalized plates of different lengths (2ft 6in., 5ft, 7ft 6in., 10ft) allowing different lengths to be constructed. An assembled large arch was 9ft 6.25in. across.

Pierced steel planks (PSP), or "Marston mats," were often used for fortifications. Normally used to surface forward airstrips, an olive drab-painted PSP was 10ft long and 15in. wide. Their edges had slots and tabs allowing them to be fastened together. In fortifications they were used for revetting and roofing. In the latter use they had to be covered by waterproofing material and supported by stringers. While strong, they could not bear weight unless supported. In Korea they were bent around the corners of roofing timbers and spiked in place to help prevent the timbers from being broken apart by heavy artillery fire.

Waterproofing materials were laid atop roofing before being covered with earth. Corrugated steel was used if available, but the most common materials were tarpaper, issued in 36in.-wide, 36ft-long rolls, and cardboard. The cardboard came from flattened ration cases and other corrugated cardboard boxes. These were laid overlapping atop roofing logs and covered with earth or sod.

Open-topped positions were sometimes protected from the weather by khaki (tan) canvas tarpaulins ("tarps"), which were officially designated paulins. The large size measured 20ft × 40ft and the small 12ft × 17ft. These were fitted with tie-cords around the edges. Olive drab, khaki, or camouflage shelter-halves were sometimes used as waterproofing covers on two-man foxholes and other small positions. Canvas cargo truck covers and issue tents were sometimes pitched over large open-topped installations for weather protection. Olive drab synthetic resin-coated duck ponchos were used in the same manner. These measured 64in. × 81 in. with a head opening in the center, which could be tied shut. Sometimes shelter-halves and ponchos were spread over a fighting position's roofing logs and covered with earth.

Rocks were used for fortifications wherever they were found, especially in North Africa and Italy. Trenches and positions were sometimes revetted with rock walls, but an artillery round near miss could collapse such emplacements unless they were braced or wire-meshed.

Principles of construction

The 1940 field fortifications manual went into much detail regarding trenches, shelters, emplacements, and obstacles based on Great War field fortifications. These were meant for long-term occupation and resistant to heavy and prolonged artillery bombardment. They were overly elaborate in design, and required a great deal of construction time and extensive materials, much of which needed to be prefabricated in rear areas. The designs were unsuited for

modern mobile warfare requiring dispersal of forces. While designs of some hasty fighting positions were provided, most of the positions were intended for static warfare. The designs served the Army well at Bataan where extensive in-depth defenses were necessary.

Many of the basic principles were retained, but the 1944 edition of the field fortification manual greatly simplified the designs of fighting positions and obstacles, provided positions for new weapons and equipment, and recognized the mobile nature of the current war. Much of the manual was based on lessons learned in combat and from British and German techniques. The Corps of Engineers and the various branch service schools had done much to design positions for new weapons and equipment. Some information regarding trenches and other elaborate fortifications was retained, as there was the chance that positional warfare, even on a temporary basis, might be required in the future.

The 1949 manual provided more lessons learned in combat, especially since much of the heaviest fighting the Army and Marines undertook occurred after the February 1944 release of the earlier manual. Emplacements for new weapons were included and more information was provided on field fortifications in wider environmental extremes. While even greater emphasis was placed on mobile warfare, concerns of the effects of nuclear weapons led to the provision of robust shelters to protect troops, weapons, equipment, and *matériel*. New concerns of chemical and biological warfare, coupled with protection from radiation, led to the updating of gas warfare protective measures founds in pre-World War II manuals. Again, information on static warfare positions was retained; this was fortuitous, as the fighting in Korea turned into a static war on the hills and ridges.

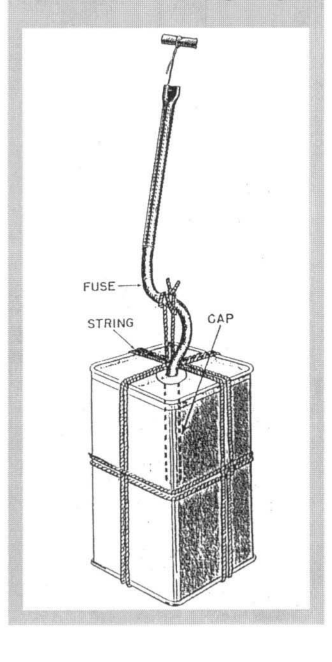
Detailed plans for the construction of field fortifications, shelters, and obstacles were provided in the manuals, but they were not expected to be replicated precisely. Even though time and resources did not always allow these ideal emplacements to be built, they still served as guides and their design influence can be seen in those actually constructed. A great deal of local initiative was undertaken. Positions would be dug making maximum use of terrain and vegetation, local materials, and novel ideas. Troops in the field seldom had the manual to hand and training in building field fortifications was limited, emphasizing instead offensive operations and the employment of mobile weapons. An inviolate rule though was that everyone dug in when halted, usually just a simple prone shelter.

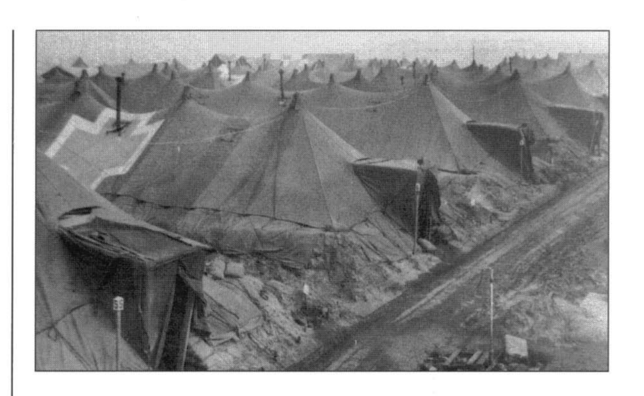
Horizontal dimensions of field fortifications were always provided, but the depth was not always specified. This allowed emplacements to be dug to accommodate individuals' height, how weapons were mounted, how parapet and existing cover were incorporated, and restrictions on depth because of extremely hard ground, bedrock, or high water tables. In such instances the emplacement might have to be completely above ground level. Most defensive positions were dug as deep as possible and kept low to the ground in order to present a low profile. The emplacement's profile was not always as low as desired, as the thickness of the roof had to protect it from heavy artillery. Foxholes though were to be sufficiently deep to provide 2ft of clearance above a crouching soldier to protect him from a tank's crushing action. In some instances the position's firing port had to be higher above the ground in order to effectively cover its field of fire, especially if firing downhill. This of course raised the emplacement's profile. Positions dug into the sides of hills, ridges, gorges and the like were usually built flush with the surface, making them difficult to detect if well camouflaged.

Interior walls were built of logs, planks, woven limbs and saplings, rock, sandbags, or ammunition boxes to prevent collapse. Rock positions had to be shored with logs as they could easily collapse. Positions built of logs were laid horizontally and the ends notched for assembly log cabin-style. Another method was to cut the ends of logs halfway through lengthwise and the width of the

Blasting holes

Exceedingly hard, rocky, or frozen ground proved to be virtually impossible to dig in with infantry hand tools. Blasting was necessary. A small starter hole was hand-dug and a small charge inserted. This created a small crater in which progressively larger charges were detonated until a hole of the desired size was obtained. Loose spoil was shoveled out, the hole's interior squared off, and firing steps added. Standard charges included 0.5 and 1 lb TNT (the latter not available until 1943), 2.5 lb M2 tetrytol, and 2.25 lb M3 or M4 C2 or C3 plastic explosive. In Normandy the assault troops were issued 0.5 lb TNT blocks (pictured) to quickly blast foxholes and withstand counterattacks. These were provided with a 6in. safety fuze with a blasting cap crimped on one end and an M1 friction fuze igniter on the other; the assembly was waterproofed with a condom. The fuze assembly was carried inside the canteen carrier beneath the canteen while the TNT block was taped to bayonet scabbards or pistol holsters or carried inside the pack. M1 and M2-series 10 lb shaped-charges, intended for destroying concrete structures, were sometimes used to create deep starter holes in which to insert cratering charges.





Rear-area installations were often afforded significant protection such as this field hospital at Anzio, Italy. The necessary engineer support and materials were available for these. Infantrymen in the frontline dug their own emplacements and used only locally available materials.

connecting log. This type of corner joint had to be spiked together.

Simple overhead cover for fighting positions might consist of logs laid across the top perpendicular to the long axis. If the position was deep enough the logs would be laid directly on the ground or even countersunk and then covered by earth flush with or only slightly heaped above ground level. It was ill advised to simply lay the logs across the top of a loose earth parapet or sandbags, which offered little support. Perpendicular logs had to support the roofing logs. This was often done though over small positions such as two-man foxholes.

For larger well-protected positions an elaborate layering construction was provided. This was called a cut-and-cover shelter. Its size depended on its use, but this design provided excellent protection from all but direct hits by heavy artillery and bombs. If built to full specifications the overhead cover would be almost 7ft thick. It might be as little as 2ft though. The degree of protection desired, time, and *matériel* resources allowed less than the full layering described here. This description provides the full 7ft-thick protection beginning from the bottom up. The width of the shelter's ceiling was covered by 2ft of tamped earth. The cut was dug wider than the shelter's width by several feet. A layer of 8in. diameter logs was laid atop this perpendicular to the shelter's long axis. All layers of logs were wired together. The logs were topped by 3ft of tamped earth as a cushion layer, followed by another layer of logs, but laid crossways to the lower layer. 1.5ft of crushed rock, gravel, or small rocks served as another cushion layer. A burster layer of 10in.-thick concrete blocks or rocks with 6in. of loose camouflaging earth or sod topped this. The burster layer either detonated early, or broke up, or caused an impacting projectile to ricochet. Waterproofing material could be laid over any layer, but the nearer to the surface the better, as this prevented seepage being absorbed by lower layers. If the waterproofing was over a deep layer it allowed the upper layers to absorb more water to increase the weight on the shelter's supports. This was the basic design, but variations of layering patterns and thicknesses were to be found. starting with as little as a layer of 6in.-diameter logs covered by 1.5ft of earth. In Korea extremely robust bunkers were built with multiple layers of crisscrossed logs and sandbags 6–8ft thick. Fighting bunkers by necessity were partly above ground to accommodate firing ports. CPs, aid stations, troop shelters, ASP and supply bunkers, and kitchens were usually flush with the ground.

Light mortars (German 50mm, Communist 60mm) did not possess the weight to penetrate most bunkers. Medium mortars (German 81mm, Communist 82mm) were more effective. Heavy mortars (German/Communist 120mm) were much more effective. Light artillery (German 75mm/105mm, Communist 76mm/85mm/122mm) had limited effect. It required medium artillery like the German 150mm or Communist 152mm to have a high degree of effect on well-prepared fortifications.

Firing ports or embrasures were kept small to make them more difficult to detect and hit. The ports were made of smaller-diameter logs, planks, or sandbags. There was usually only one firing port; seldom did additional ports exist to cover alternate sectors.

Open-topped fighting positions such as foxholes, trenches, and machine-gun, mortar, and AT weapons positions were characterized by being kept as small as practical, just large enough to accommodate the weapon and minimal crew. Parapets were about 1ft high with the earth spread out as much as 4ft across. Parapets were required to be at least 3ft thick to protect from small arms. Often higher parapets were used if hard ground, time, or high ground-water did not allow the positions to be dug sufficiently deep.

Several types of revetting materials were available. Sandbags and sod were ideal, but required the position to be excavated to a greater width to accommodate them. Sandbags or sod might only require the lower one- to two-thirds of the sides to be revetted, provided that the soil was stable. Burlap or oznaburg and chicken wire or mesh lined the facing, and were held in place by stakes or pickets. Before applying the facing a vertical groove was cut with a pick to allow the stake to be recessed in the wall. The stakes were placed 1.5ft to 6ft apart depending on the soil's stability. This type of facing protected the walls from weathering and wear. It offered only minimal support to prevent the wall from collapsing from near hits. It was little used in combat zones because of the construction time, and lack of materials. More common were corrugated steel, planks, and small-diameter logs held in place by the same stake materials and intervals as mesh revetting.

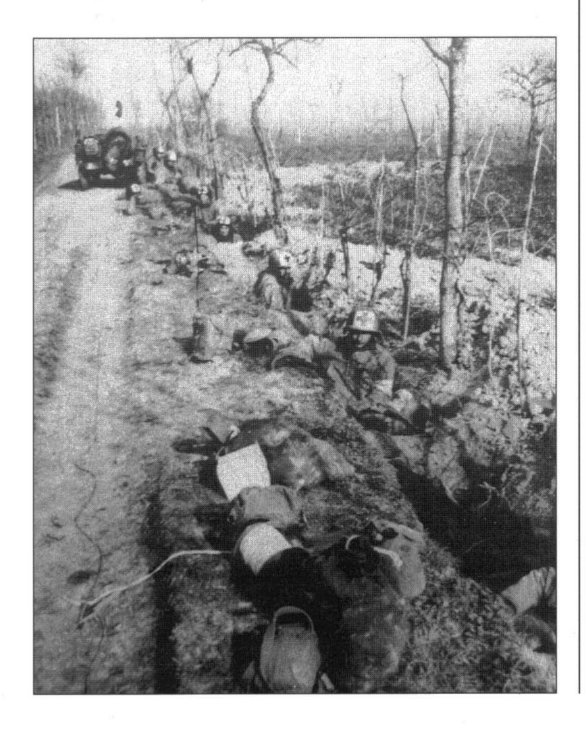
Readily available brushwood and saplings were the most common revetting material. The normal means of construction was to drive stakes about 1.5ft into the ground 4in. from the wall at one-pace intervals. Brushwood was packed horizontally behind the stakes, or small-diameter logs could be stacked up. The pickets were drawn tight against the wall by means of holdfasts. Another construction method was the brushwood hurdle. This could be assembled in the rear and then emplaced in the position. Five wooden stakes c.6ft-long were driven into the ground at 1.5ft intervals. Brushwood was woven wicker-style horizontally through the stakes. Using pre-cut brushwood two men could construct a hurdle quickly. The completed section was pulled up and installed in the emplacement by driving the stakes firmly into the ground. The irregular ends were overlapped and woven through the adjacent stakes. Holdfasts again were used to secure the revetting in place. Another means was to fill black, waterproofed, spiral cardboard ammunition tubes with earth and stack them horizontally. Since these metal-capped tubes were only about 3ft long numerous support posts were required.

Holdfasts or "deadmen" were installed by digging a small trench through the parapet perpendicular to the emplacement's sides. A stake was driven firmly into the ground 8–10ft (often less) from the revetment. One or more strands of wire were attached to the top of the revetting stake and the securing stake. A stick was twisted through the center portion of the wire and turned to draw it tight. The groove through the parapet was backfilled.

Sandbags, whether used for revetting, breastworks, or for the walls of emplacements, had to be stacked properly. Sandbag walls were built with a slope of 3-on-1 or 4-on-1. It was not uncommon for them to be built vertically though. To understand the construction of sandbag walls several terms must be explained. A "header" is a sandbag laid with its length perpendicular to the wall. The "seam" is the sandbag's long side with the edge seam. The "stretcher" is the long side of the sandbag without a seam. The "choke" is the closed end (see the page 43 illustration).

The bags were to be laid with the chokes and seams against the wall; in other words, the exposed side comprised stretchers and headers. The base layer consisted of headers, that is the long length of the sandbag laid perpendicular to the wall. Then two sandbags were stacked side-by-side atop the base followed by alternating layers of headers and stretchers stacked brick-like with the joints broken. The top layer also comprised headers. Photographic evidence shows that these practices were not always adhered to, as they would be stacked haphazardly with unbroken joints and seams and chokes out.

Medical units in forward areas lived in different circumstances to those in the rear. Here medical aid men, probably belonging to a battalion or regimental aid station, have dug in along this Italian roadside ditch, a common practice for forward-area troops.



Sod too could be used for revetments. It was cut in 9in. × 18in. sections and stacked in a brick-like manner. The grass side was laid face down in each layer, except for the top header layer which had the grass facing up.

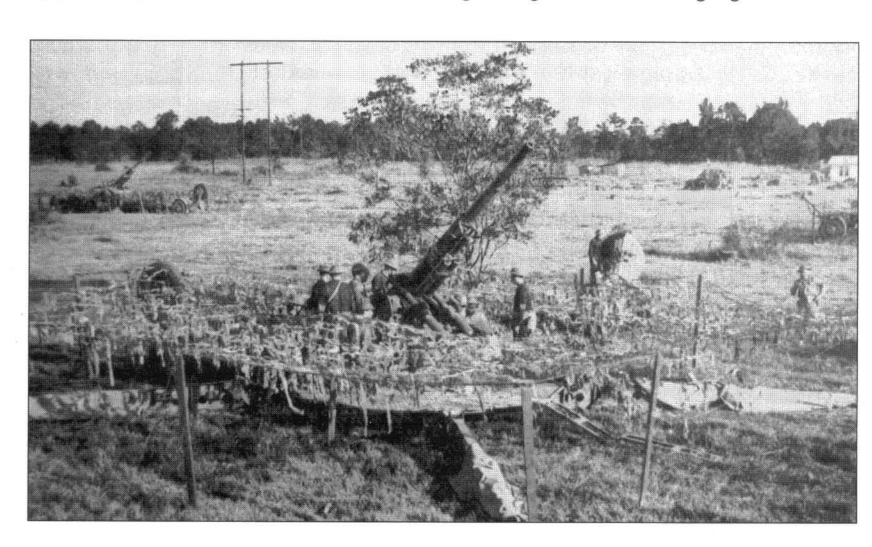
When an emplacement was dug, be it a foxhole, trench, gun position, or bunker, the sod or other ground cover was first removed, placed to the side, and then used to cover the parapet, overhead cover, and other exposed soil. Exposed dug soil was often of a different color to the topsoil and would change color once air-dried. The texture of loose soil reflected light differently to undisturbed soil and showed up on black-and-white aerial photographs as white against darker gray ground. While this was not a major concern for US forces through most of the war, it was still essential to camouflage parapets and other signs of construction from ground observation. Besides sod and other dug ground, dead leaves, small leafy tree braches, or pine boughs could be laid over parapets.

Entrances to positions were normally in the rear, but in some instances they might be on the side of a position depending on the protection and concealment afforded by surrounding terrain. Entrances were often protected to prevent direct fire, blast, fragmentation, and grenades from entering. There might be a blast barrier inside the position or a similar barrier or wall on the outside. An entry trench with at least one right-angle turn was preferred. Many positions though had only a straight, unprotected entryway.

Ammunition niches were dug into the sides of trenches and other positions. Usually a wooden box was inserted in the niche. Plans did not make mention of ammunition storage though. For large-caliber weapons (mortars, AT guns) ammunition was often merely stacked in the position's rear or behind it. Artillery positions did provide for ammunition, propellant, and fuze storage though. Ready racks were dug into the side of the position's parapets. Additional storage was in open pits to the rear. Artillery, AT and AA gun positions often had what were called special trenches dug immediately adjacent to or connected to the gun's position. These protected the crew from counterbattery fire, tank and air attack, and could serve as defensive positions against infantry attack. Sometimes one-man foxholes were dug within the position or beside it for the same reason.

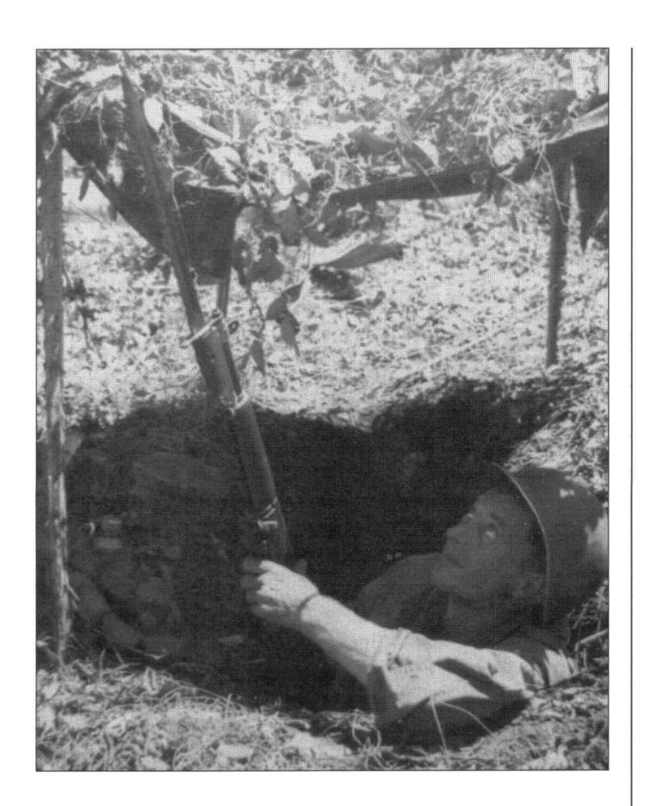
Camouflage

The three fundamental means of concealing an emplacement, object, or activity were blending, hiding, and deceiving. Blending concealed the emplacement or object by arranging camouflage materials to make them appear as part of the natural surrounding background or changing the nature



Ideally a unit took full advantage of camouflage measures, as this 3in. M3 AA gun unit has done during pre-war maneuvers. The camouflage net was rigged to cover the gun, but when required to fire, the net was dropped to provide a clear field of fire. The mount's outriggers have been camouflaged with canvas. It required almost two hours to erect such a net system and it was seldom undertaken in combat.

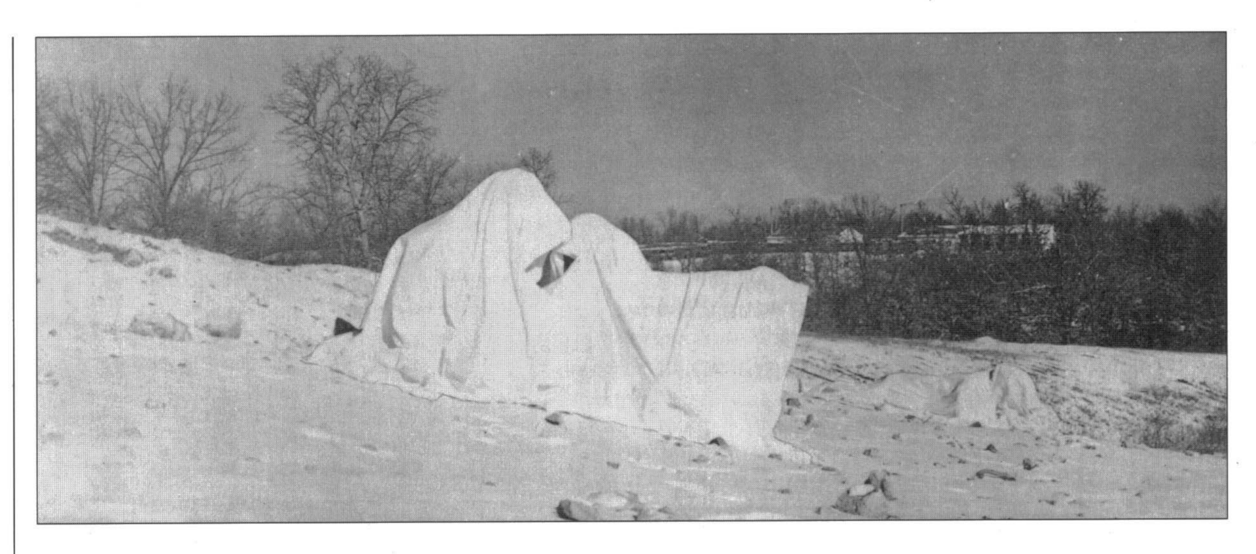
of the site's appearance. An example is arranging existing natural vegetation or artificial materials in such a manner that the object cannot be seen or appears to be something different. Hiding conceals the identity of an object or type of activity by screening; for example, a draped camouflage net may be detectable by the enemy and the object's location determined, but concealment prevents identification of the object or what activity is taking pace. Deception simulates emplacements, objects, or activity, to lead the enemy to attack or avoid the area. Examples include dummy defensive positions, decoy vehicles, or deceptive activity.


This well-camouflaged position has a shelter-half covering the hole at ground level and a poncho rigged to conceal the opening from aerial detection. Vegetation and matted leaves gathered from the ground camouflage the coverings.

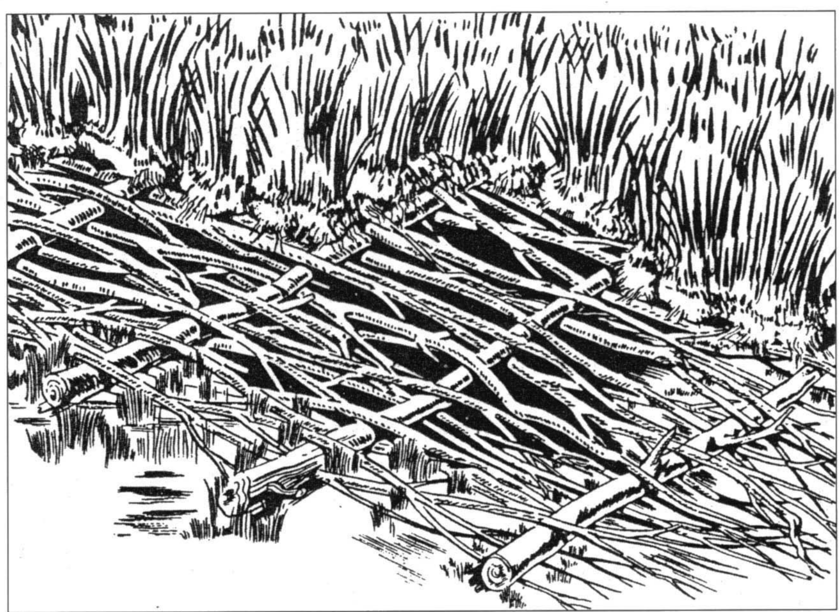
Natural camouflaging materials were the most commonly used to conceal frontline positions and activity. Existing vegetation was left in place except when necessary to clear fields of observation and fire. Such areas were cleared just enough to detect the advancing enemy, or else they would appear obvious and the enemy would avoid them. The raw ends of cut brush and saplings could be smeared with mud to make the fresh cuts less obvious. Vegetation could be transplanted to conceal a position, but it was seldom that this effort was made. More commonly, local vegetation was cut, preferably well to the rear, and laid over parapets and overhead cover. This had to be changed at least daily because of wilting and changes in color and texture. American troops were somewhat notorious for neglecting this as well as for using the wrong vegetation such as laying pine boughs on the ground among leafy bushes. They often simply did not bother to first remove sod or other ground cover before digging in. Rather than covering the parapet with sod or matted leaves the earth was simply piled up and left bare. A typical American practice was to hide an emplacement rather than blend it. Dead limbs, logs, rocks, and other materials would be haphazardly piled over an emplacement making it look unnatural or out of place. Little effort was made to blend the camouflage into the surrounding vegetation and terrain. Another common American camouflage infraction was undisciplined control of vehicles in forward areas. Vehicles were driven when and where desired leaving a profusion of tracks easily detectable from the air. There were of course exceptions to this with some units and individuals undertaking effective camouflage measures. Much of this disregard for camouflage was due to the limited air threat. Other than in North Africa and the Solomons in the Pacific the Allies usually held air superiority.

In training, when and if instruction was given on the construction of fighting positions, little attention was given to camouflage measures. Most troops were taught to construct a small frame of interwoven saplings and limbs and attaching vegetation to use as camouflaged foxhole covers. Such "spider holes" allowed a solider to remain concealed as the enemy approached and then open fire at close range. Another camouflage measure that most US troops mastered was noise and light discipline.

In barren, snow-covered, and featureless desert areas it was cautioned that camouflaged positions should not be located near any existing features that allowed an enemy observer to reference the position's location. Snow was not as easy to use for camouflaging positions as may be assumed. Dug snow contrasts greatly with undisrupted snow and even after additional snowfall it appears different. Vehicle and foot tracks point to positions. Machine guns, AT guns, and artillery cause powder and blast marks in front of firing positions



ABOVE A first impression of this white cloth-draped M1917A1 machine-gun crew is that they are well camouflaged in the snow—which they are at several hundred yards. However, depending on lighting conditions, within 200–300 yds they are conspicuous. Often, white cloth stands out against snow because of the difference in the shade of white, and because the cloth reflects light differently to snow. Tracks could also point to the crew. An additional member forward of the gun is less obvious.



RIGHT A foxhole camouflage cover fabricated from small limbs and sods of earth. Leafy branches, pine and palm boughs, and other natural materials could be used to fabricate this "spider hole" cover.

making them easy to detect. Any movement, even by white-clad troops, is easily detectable against snow backgrounds. Smoke from heating and cooking fires signals the locations of positions. White sheets were often used to conceal crew-served weapons, but were easily detected at close range.

Camouflage nets were issued in four sizes: 22ft × 22ft, 30ft × 30ft, 36ft × 44ft, and 45ft × 45ft. AT gun and towed-cannon crews were issued the 30ft × 30ft net. These nets were pre-garnished with dyed strips of burlap-like osnaburg cloth and available in three color combinations: woodland (dark and light green, dark brown), desert (tan, dark brown, light green), and winter (dark brown, tan, light green). Garnishing material was denser in the net's center, about 80 percent, and decreasing to 10 percent toward the edges. This allowed it to blend into the surrounding natural vegetation. Camouflage nets were erected either as flattops to conceal the position from overhead aerial observation or as a drape net. Drape nets provided concealment from ground and low-level aerial observation. Small camouflage nets were tested for individual concealment, but were found to snag on weapons, equipment, and when moving, on vegetation. They also hampered the operation of weapons.

Types of emplacements

Field fortifications were classified as either hasty or deliberate. Hasty positions could be constructed quickly, usually under an hour, with infantry hand tools. They provided minimal protection and made maximum use of existing cover (protection from fire and observation) and concealment (protection from observation only). They may have been temporary in nature, being occupied for only a few hours, or could be improved to make more elaborate, deliberate emplacements. Deliberate positions required more effort and the use of additional construction materials. They might be occupied for only a day, or for a prolonged period. Such positions were continuously improved for as long as they were occupied.

Infantry emplacements

The basic position for riflemen was the skirmisher trench. This type of position dates back to early in the 19th century, when firearms became more deadly. Even though the US did not issue entrenching tools (used by European armies since the 1880s) to its soldiers until 1909, skirmisher trenches were previously scraped in the ground using spike bayonets, cups, and mess-kit pans. The trench could be dug in 10–12 minutes in soft soil, providing adequate protection from small-arms fire, but not from artillery or mortars. The trench was the length of the soldier's body, some 2.5ft wide and about 5in. deep at the head end sloping to about 9in. at the feet. All spoil was heaped to the front in a 9in.-high, crescent-shaped parapet. The pack could be placed in front for additional protection. Soldiers were taught that any irregularity in the ground, even a fold or dip of 0.5ft, added to the cover.

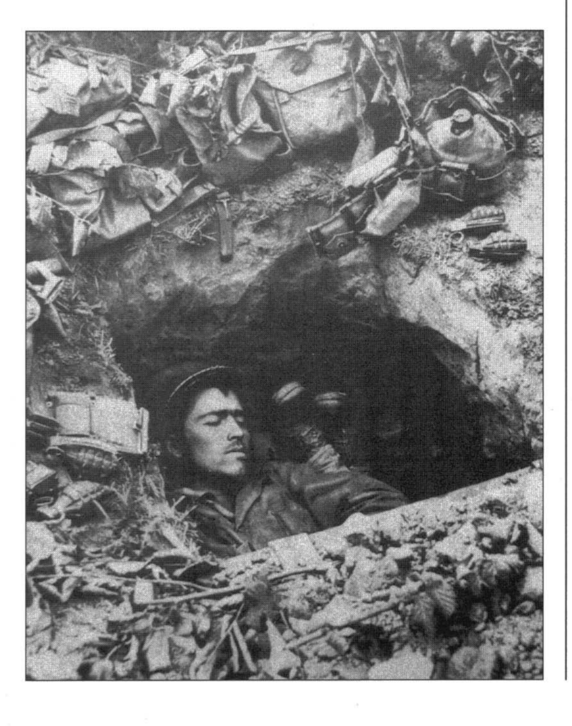
Another hasty emplacement was the improved shell hole. Any crater of sufficient size provided immediate protection from fire, but a suitably sized crater could be rapidly converted to a fighting position by digging a firing step or elbow rest in the forward side and using the spoil to level out the bottom. In most cases light artillery craters had to be deepened.

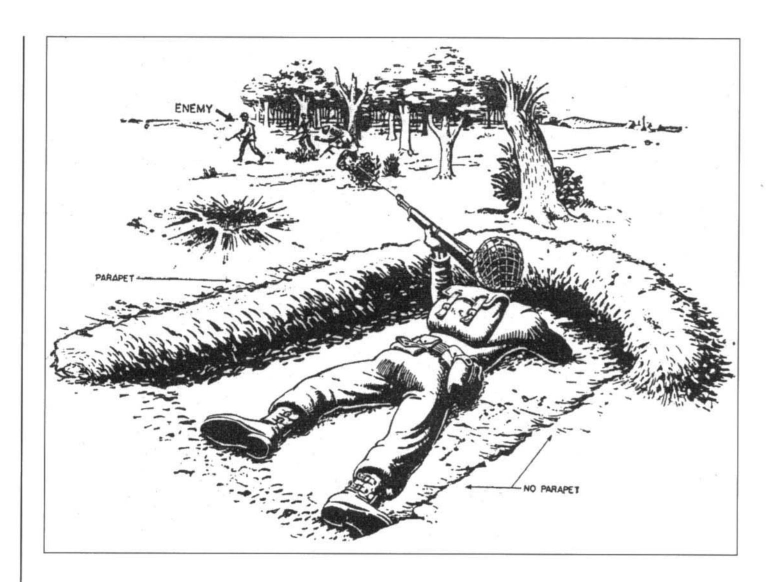
The 1940 manual viewed the foxhole too as a hasty position, a simple one-man hole about 3ft in diameter at the top and 2ft at the bottom dug suitably deep for crouching, kneeling, or standing. Earth was thrown to the front (parapet) and rear (parados) in crescents. (The term "parados" fell from use in World War II being replaced by "rear parapet.")

An extension of the skirmisher trench was the prone shelter adopted early in the war. It was intended to provide a quickly dug shelter for protection from artillery and air attack. It was ill suited as a firing position and insufficiently deep to protect against tanks. The 1944 manual even specified them as "authorized in rear areas when ground attack is unlikely." Due to time constraints they were often used as hasty fighting positions in forward areas.

A new type of foxhole was specified in the 1944 manual, but it was first described in a 1942 training circular. It was basically an improvement of the German rifleman's position. It was also influenced by the Japanese fighting positions the Marines discovered and adopted on

A non-standard but commonly used position was a shallow prone shelter wide enough for two men to use as a sleeping shelter. Planks and earth cover this one. Logs, sheet metal, or doors removed from buildings could also be used.





A skirmisher's trench, the most basic of hastily erected fighting positions. The parapet could be extended on both sides. In soft soil such a trench could be created in 10–12 minutes.

Guadalcanal. Both one- and two-man designs were provided. If one-man positions were employed they were at least 5 yds apart. Two-man positions were at least 10 yds apart. The two-man foxhole was generally preferred allowing one man to rest while the other stood watch. Two men gave each other moral support and if one was wounded the other could treat him. The position could still conduct the defense if one man became a casualty. One of the few advantages of the one-man foxhole was that it was easier to conceal.

Common characteristics between the two types were that they were 2ft wide, and the firing step was 4–5ft deep to accommodate the soldier; a 1.5ft-deep sump allowed the collection and bailing of water and space for the soldier's legs when sitting on the firing step. Spoil was spread out around the hole to provide a 6in.-high parapet at least 3ft thick, forming an elbow rest between the lip of the hole and the inner side of the parapet. Most illustrations depict parapets as neat and of equal width. In practice they were irregular in height and width due to camouflage and rushed work. Natural cover could be incorporated into the parapet such as a fallen tree, rocks, three stumps, etc. The long axis of foxholes was parallel with the MLR. The one-man foxhole was 3.5ft long with a 1.5ft-long sump. The two-man hole was 6ft long with a 2ft-long sump between the two firing steps. If the position was occupied long enough a 2–3ft-deep slit trench would be dug to the rear and covered with logs and earth to provide a one-man sleeping area. No plans were specified for this in the manuals until after the World War II. Another post-war improvement was an angled hole dug into the side of the sump the same diameter as the e-tool as deep as could be dug. This was a grenade sump, into which a hand grenade thrown into the hole could be kicked. This idea was adopted from the Japanese.

An extension of the skirmisher's trench, the prone shelter, was not intended as a fighting position but was often used as such. Similar two-man shelters were also dug and could have light overhead cover.

Many non-standard foxholes were used in the field. One example was a 2–3ft-square foxhole without sump connected by a shallow 6ft-long slit trench, with light overhead cover as a sleeping area. Y-shaped three-man foxholes were also used. In rare instances shallow crawl trenches connected foxholes. The trench usually ran behind the holes and was connected by short slit trenches.

The BAR was positioned in a one- or two-man foxhole, the latter being preferred. The foxhole required no modification other than a lower parapet to allow the weapon's bipod to be set atop it whilst retaining a low profile.

The 2.36in. (World War II) and 3.5in. (Korean War) bazookas presented an emplacement design problem never before encountered. Upon firing, the weapon generated a considerable rocket back blast into a large triangular-shaped area. The 2.36in. had a danger area 25 yds deep and 25 yds across the base. The 3.5in. danger area was 35 yds deep and 35 yds across. This required the area behind the launcher to be clear of personnel and obstructions. Bazooka

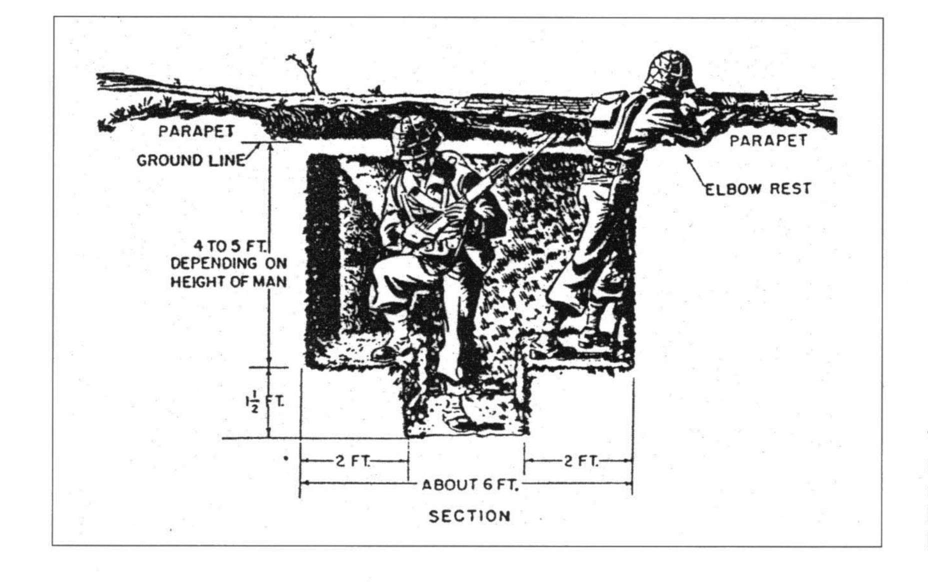
positions had to have very low or no rear parapets. The gunner had to be certain that if he elevated the muzzle the breech was not angled down where the back blast would blow into the parapet or the emplacement's back wall, causing the considerable blast to be deflected into the position. It could not be fired from within a building unless in a very large room, such as a warehouse, with open doors and windows to relieve the over-pressure.

A bazooka could be operated from a two-man foxhole though it was best to delete the rear parapet. Two types of bazooka firing positions were prescribed. The pit-foxhole type was a simple 3ft-diameter hole approximately 3.5ft deep. It had room for the assistant gunner to turn with the traversing launcher so that he was never behind it. It was shallow enough to ensure the breech, at maximum elevation held by a standing gunner, was clear of the parapet. Being a small shallow hole in which two men could not crouch, it offered no protection from over-running tanks. Two one-man foxholes, about 2.5ft x 3ft, without sumps, but sufficiently deep to protect the crew from tanks and artillery fire, were dug about 5ft to the rear of the firing pit; they were without parapets, with the spoil added to the firing pit's circular parapet. The second type of position was the pit type. This was a 4ft-diameter, 3.5ft-deep pit with a 2ft-diameter 2ft-deep circular sump dug in its center. This allowed the crew to sit with their legs in the sump. It could have a low parapet, or the spoil could be removed.

Often bazookas engaged targets outside of an emplacement. The crew would remain in a protected position and then emerge to maneuver into an effective firing position using natural cover and concealment. Another reason prepared firing emplacements were seldom dug for bazookas was that the weapon's considerable firing signature of smoke and dust immediately revealed its position. It was better simply to stalk marauding tanks.



The one-man foxhole could be enlarged to a two-man version by digging another firing step. The occupant could sit on the step with his legs in the sump. The sump also collected rainwater.

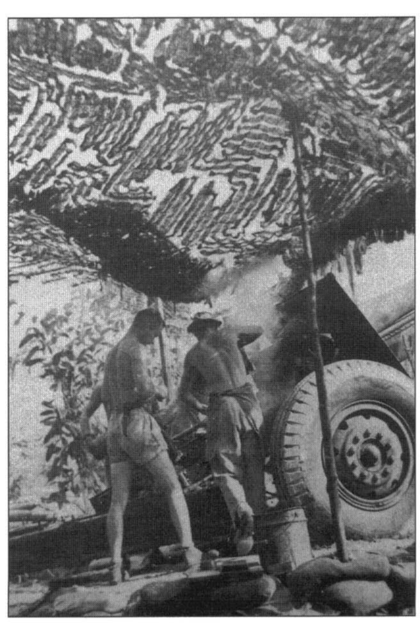


The two-man foxhole allowed one man to rest and the other to remain on guard. A fallen tree has been incorporated into this hole's parapet.

TOP A Marine 75mm M1A1 pack howitzer emplacement on Guadalcanal. This sandbag revetment, camouflaged by paint dabs, was primarily for protection from snipers.

BOTTOM Further in the rear on Guadalcanal a 155mm M1918 howitzer is hidden by a flattop-rigged camouflage net, which just as importantly served to provide shade from the tropical sun. This provides a good view of the net's garnishing strips.





Crew-served weapon emplacements

There were several alternatives for machine gun positions. A hasty position was a 5ft-wide, 8ft-long oval, dug 6 in. deep for an LMG and 1 to 1.5ft deep for an HMG. The gun was emplaced in one end of the position and the spoil spread in a low parapet.

"Horseshoe" emplacements for LMGs and HMGs differed. This type of position allowed the gun a wide traverse. The weapon could be fired to the rear in an emergency with the gunner turning the gun to the rear and sitting on the forward edge of the lip inside the parapet. A 2ft-wide U-shaped trench was dug around a gun platform 3.5ft wide, 3.5ft long with the open end of the "U" facing the enemy. The platform was 6in. below ground level with the trench dug so that the platform was waist level. A low parapet surrounded the position. The HMG horseshoe position was distinguished by a 2ft-wide shelf platform 1 to 1.5ft deep running across the position's front, the open end of the "U." The gun platform was a 3ft-wide, 3.5ft-long extension of the shelf.

Foxhole-type machine gun positions could consist of two or three one-man foxholes. The holes were usually of the simple type without a sump, but the standard one-man foxhole could be dug to provide tank-overrun protection. Any of the types could be used with LMGs or HMGs, although the two-hole type was best suited for the LMG and the three-hole for the HMG. Regardless of the number of foxholes, the parapet was constructed in a circular pattern around the holes leaving a clear area within the parapet circle for the gun.

For the two-foxhole position the LMG tripod was oriented in the principal direction of fire and a foxhole for the gunner dug behind it. Another foxhole for the assistant gunner was dug to the gun's left and 2ft further forward of the gunner's hole. To fire to the right the gun was traversed and the assistant became the gunner. To fire to the rear the gun was moved to the left of the gunner's hole and the rear of the assistant gunner's, and the two soldiers changed roles. From this same position the gunner could fire the weapon to the left.

For the three-foxhole position the HMG tripod was set in position, a foxhole was dug on either side 4ft apart, and a third one for the gunner behind the gun. The assistant gunner occupied the left hole and the right was unoccupied, although another member of the crew could occupy it. To fire to the right, the gun was traversed in that direction and the assistant gunner operated it. To fire to the left the gunner moved to the right hole and the assistant to the gunner's hole.

An LMG squad was manned by five men and the HMG by seven. They would dig one- and two-man foxholes on either side of the gun position for close-in protection, provide additional ammunition stowed in their holes, and add their carbine fire to the defense.

The HMG could be employed in the air defense role by attaching an elevator, a vertical extension mount, to the tripod. A minimum 4ft-diameter pit was dug to about 4ft. It provided sufficient space for the gunner and assistant and allowed all-round AA fire.

Each field artillery battery had two .50-cal. M2 aircooled machine guns for air defense and ground attack. Each 90mm AA gun was provided a .50-cal. M2 watercooled. Artillery batteries were concerned with both ground and air defense. They used a 9ft-diameter, 2.5ft-deep pit. The .50-cal. was mounted on the standard M3 tripod fitted with the M1 elevator cradle. From 1945 the M63 mount was available. This was a lower mount and it was set on a 4ft-diameter platform surrounded by a 2–3ft-deep circular trench. The .50-cal. M2 watercooled machine gun was provided with an M2, M2A1 or M3 AA tripod. Intended mainly for air defense, this position called for a minimum 8ft inside diameter, and above ground a 4ft-high parapet at

least 3ft thick. The parapet could be made of sandbags, piled earth, rocks (preferably lined and topped with sandbags), or earth-filled 90mm AA gun ammunition boxes. A covered recess was recommended for ammunition and the water chest.

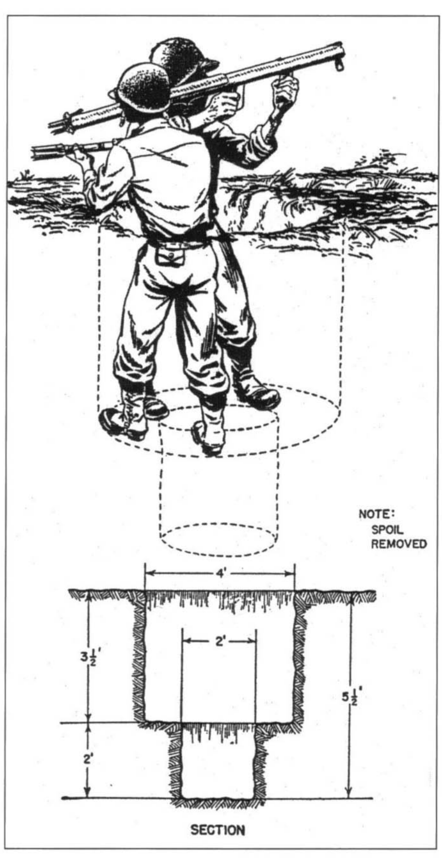
Emplacements for 60mm and 81mm mortars were open-type rectangular pits. The front wall was lightly sloped and the parapet was open to the front to provide line-of-fire clearance and so that the red and white striped aiming stake about 10 yds to the front was visible through the mortar's sight. The pit was just large enough for the mortar, gunner, assistant gunner, and a few ready rounds. The 60mm emplacement was 5ft wide, 4ft from front to back, and 3.5ft deep. The 81mm was 6ft wide, 4ft from front to back, and 4.5ft deep. A more quickly dug 60mm position comprised two one-man foxholes dug in a "V" pattern with the "point" oriented to the front and separated by 3ft. The mortar was set up between the two holes on ground level and the spoil piled in the circular parapet. Other members of the five- (60mm) and eight-man (81mm) crews dug one-man foxholes, prone shelters, or special trenches near the position. Pits were dug to the rear for additional ammunition.

In actual combat mortars were more often simply emplaced behind any available defiladed cover that offered protection from observation and fire from the front: gullies, wide ditches, road or railroad cuts, depressions, behind buildings, embankments, walls, brush or tree lines, reverse slopes of hills, and so on. Often the location of mortars in forests and jungles was determined by the scarcity of clearings. Even then the height of trees may have prevented the use of mortars. When emplacements were built they often consisted of circular or square-shaped, 3–4ft-high sandbag parapets. These might be 6–8ft across to allow room for one or two additional crewmembers improving the efficiency of mortar operation as well as room for additional ammunition. Similar emplacements were prepared for 4.2in. mortars.

Several types of emplacements were prescribed for towed AT guns. The dimensions of the following emplacements are for the

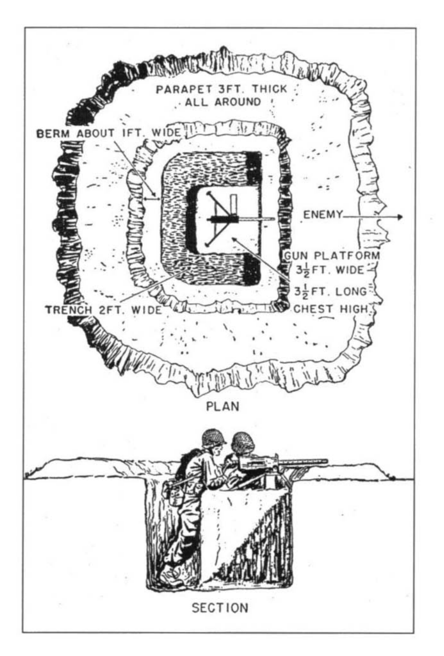
LEFT The foxhole-type bazooka emplacement provided a circular pit just large enough for the two-man crew to operate the weapon. One-man foxholes or prone shelters were dug to the sides for more substantial protection for the crew.

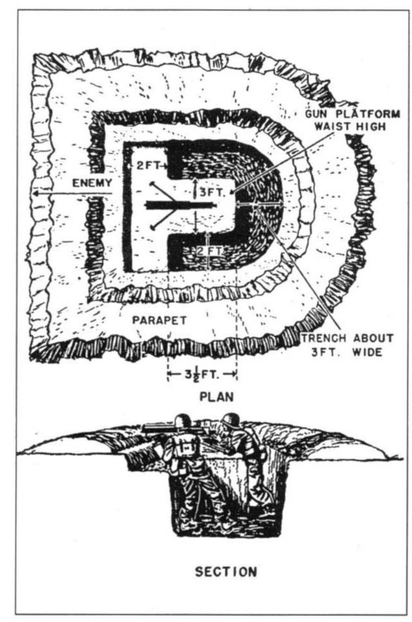
RIGHT The pit-type bazooka emplacement was a larger circular pit with a sump allowing the crew to take shelter within the position. Any bazooka position had to have a clear area to the rear because of the back blast.



RIGHT The horseshoe-shaped light machine-gun emplacement could be provided with log and sandbag side walls and roofed over as a bunker.

FAR RIGHT The horseshoe-shaped heavy machine-gun emplacement differed from its LMG counterpart by provision of a forward shelf to accommodate the water chest and other gear.





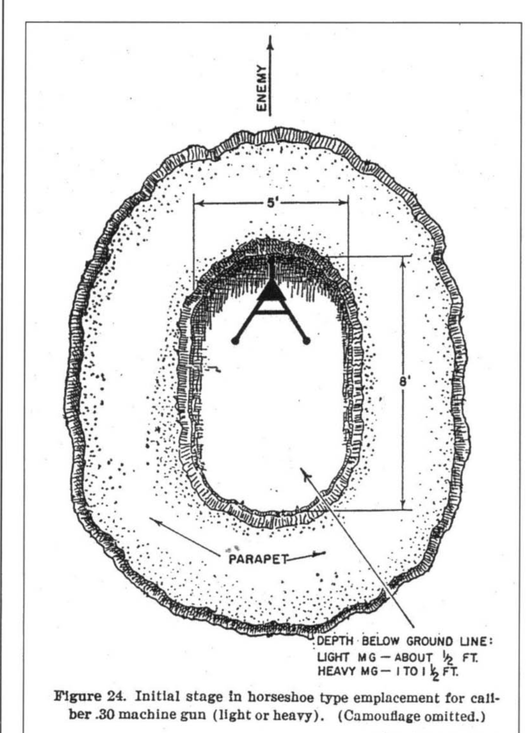


Figure 24. Initial stage in horseshoe type emplacement for caliber .30 machine gun (light or heavy). (Camouflage omitted.)

This hasty light machine-gun emplacement could be expanded into a horseshoe type, but it was the most commonly used type of position for both light and heavy machine guns.

37mm M3A1 AT gun; positions for 57mm M1 and 3in. M5 AT guns were correspondingly larger. The simplest emplacement was a 1ft-deep, 11ft-diameter pit with the earth piled in a 9in.-high, 4ft-thick parapet. This emplacement allowed for all-round fire. The emplacement prescribed in the manual did not provide for the gun's removal other than that the interior and exterior sides of the parapet were to be well sloped to allow its entry and exit. In actual practice an exit ramp was sometimes provided in the rear through a gap in the parapet. It was essential that AT guns could be quickly relocated to alternate positions to prolong their survival.

The fan-type emplacement restricted the gun's field of fire, but provided greater protection. This type of position was used when a specific sector of fire was allocated, such as enfilading a road or a canalized armor avenue of approach. A fan-shaped pit was dug about 1.5ft deep with a centerline length of some 10ft, and about 17ft across the wide portion of the curved rear. Spoil was piled to the forward sides leaving an opening for the gun's muzzle. A rear exit ramp was provided. The fan-type emplacement for a 57mm AT gun was similar, but 2ft deep, 18.5ft in length, and about 19ft across the rear.

The rectangular pit-type emplacement was best suited for forward sloping terrain, but could be used anywhere. The position was 14ft long, 10ft wide, and 3.5ft deep. Spoil was piled around all sides except for the exit/firing ramp. A 6ft-wide exit ramp to the front also served as the firing ramp. The gun could be manhandled into the rear portion of the pit for protection. Due to the amount of excavation required it was seldom that this type of position was constructed; a much simplified design could be used instead.

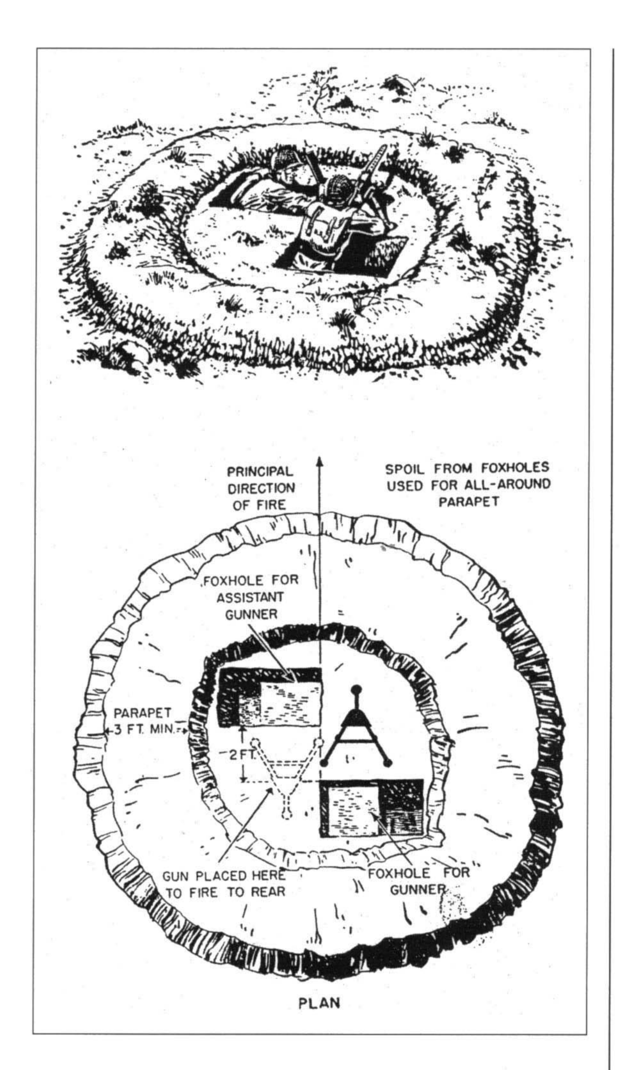
All of these positions could have three or more one-man foxholes or slit trenches dug within them for further crew protection. Ready ammunition niches could be dug into the position's center near the gun or set in parapet recesses. Ammunition pits were dug to the rear. Additional crewmembers dug one-man foxholes, prone shelters, or special trenches nearby. The 37mm AT gun had a five-man crew and the 57mm ten. Each AT gun crew additionally

had a 2.36in. bazooka, but seldom was an emplacement dug specifically for it. Because towed AT guns had to be rapidly withdrawn and re-positioned frequently they were often emplaced behind any available cover. The less it looked like a possible AT gun position to tanks, the better.

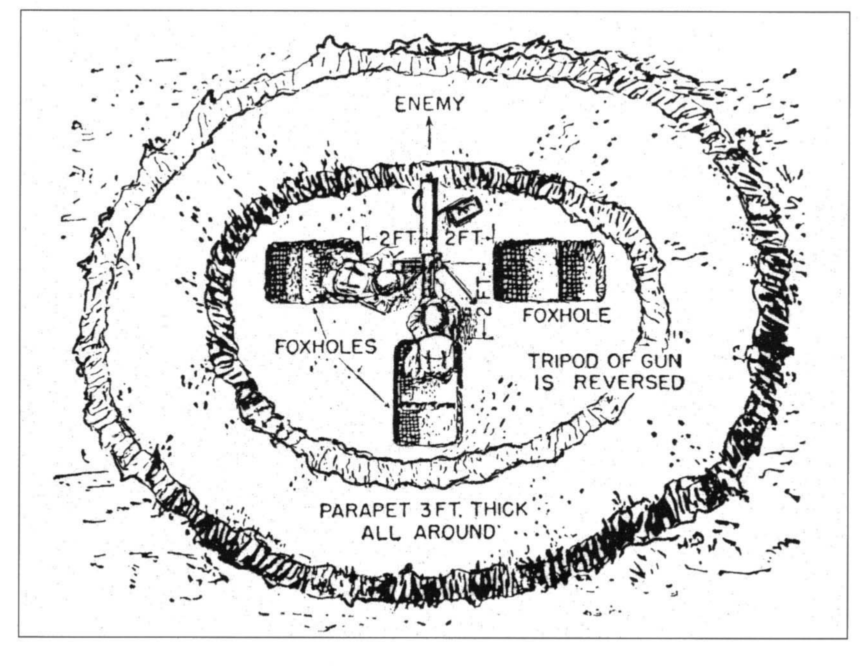
Emplacements for the cannon company's 75mm M1A1 or 105mm M3 pack howitzers were similar to the circular AT gun emplacement, but with rear exit ramps. The pits were about 2ft deep and 15ft in diameter for the 75mm and 19ft for the105mm. They were surrounded by a parapet except at the ramp. The positions were designed to allow the cannons to deliver all-round fire as well as direct fire; they were provided AT rounds. Ready ammunition niches could be dug into parapet recesses and ammunition pits to the rear. The 75mm six-man and 105mm ten-man crew dug one-man foxholes, prone shelters, or special trenches.

The Korean War saw the first widespread use of recoilless rifles (RRs) against tanks, bunkers, and personnel. They had the same emplacement challenges as bazookas (considerable back blast and a significant firing signature) but were not as mobile. The 57mm M18A1 could be fired from the shoulder like a bazooka, from the ground mounted on its integral bipod and monopod, or on the M1917A1 tripod (as used with the M1917A1 HMG). The 75mm could only be fired from the M1917A1 tripod. For shoulder firing the 57mm RR could be fired from a bazooka-type emplacement, a foxhole, or from any other cover so long as the back blast area was clear.

The two-foxhole type emplacement called for two one-man foxholes side-by-side and 2ft apart. The tripod-mounted 57mm RR was simply set on ground level



ABOVE This two-foxhole LMG emplacement could be dug more quickly than the horseshoe type. It also allowed alternative firing positions.

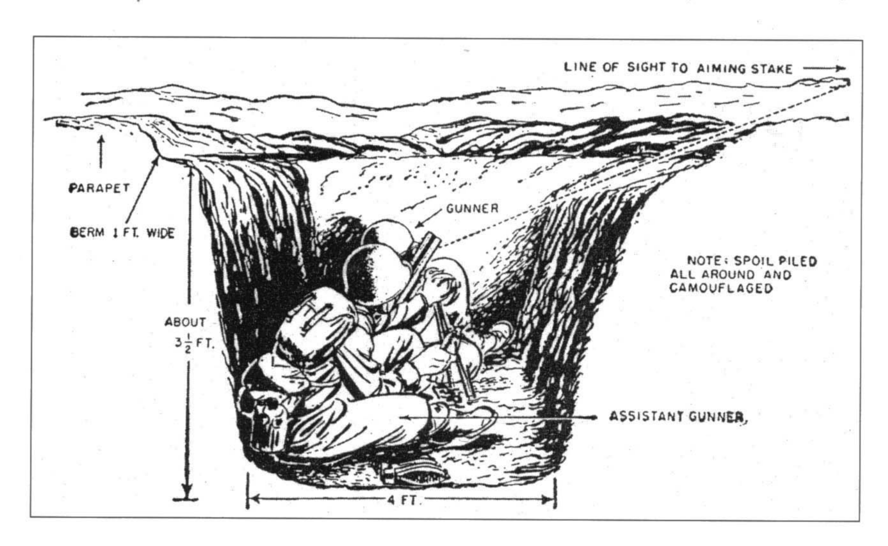


LEFT The three-foxhole type HMG emplacement allowed the crew to switch holes and traverse the gun in other directions. The two- and three-foxhole type position could be used for both LMGs and HMGs.

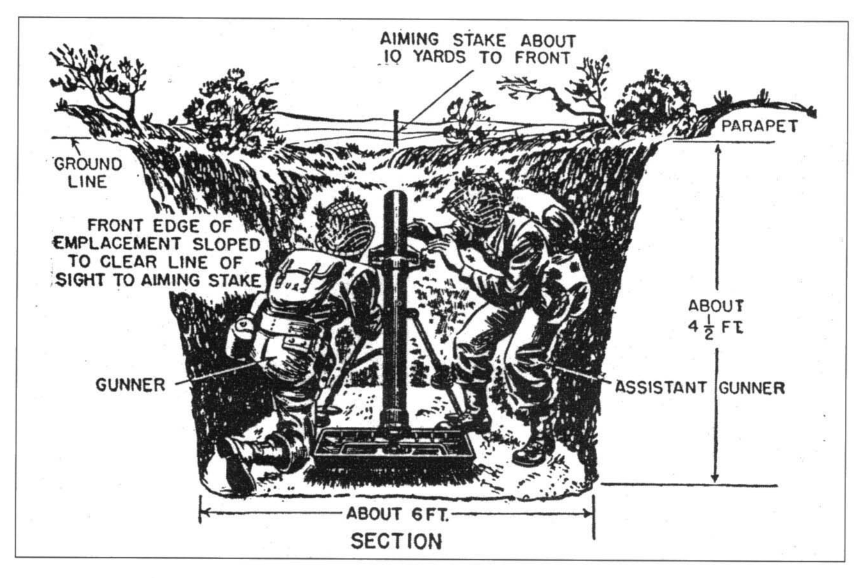


Construction of a heavy machine gun emplacement

LEFT The horseshoe-type machine gun emplacement was influenced by a German design. This emplacement houses a .30-cal. M1917A1 Browning HMG. A two-foot wide U-shaped trench has been dug around the waist-height gun platform; the platform is 3.5ft wide and 3.5ft long, with a 3ft-wide shelf platform (the shelf was not used in LMG emplacements). The sides have been revetted with brushwood and secured with wire holdfasts. Two men would man the gun while the remainder of the seven-man crew would dig one- and two-man foxholes to the flanks. The only tools typically available to dig such a position were the M1943 entrenching tool and the M1910 pick-axe. A wooden stake to the gun's right indicated the final protective fire line. When the signal was given to execute final protective fire, the gun was traversed hard against the stake then fired in long repeated bursts on a line across the unit's front. This maneuver would provide a near continuous bullet stream through which the attackers had to pass.



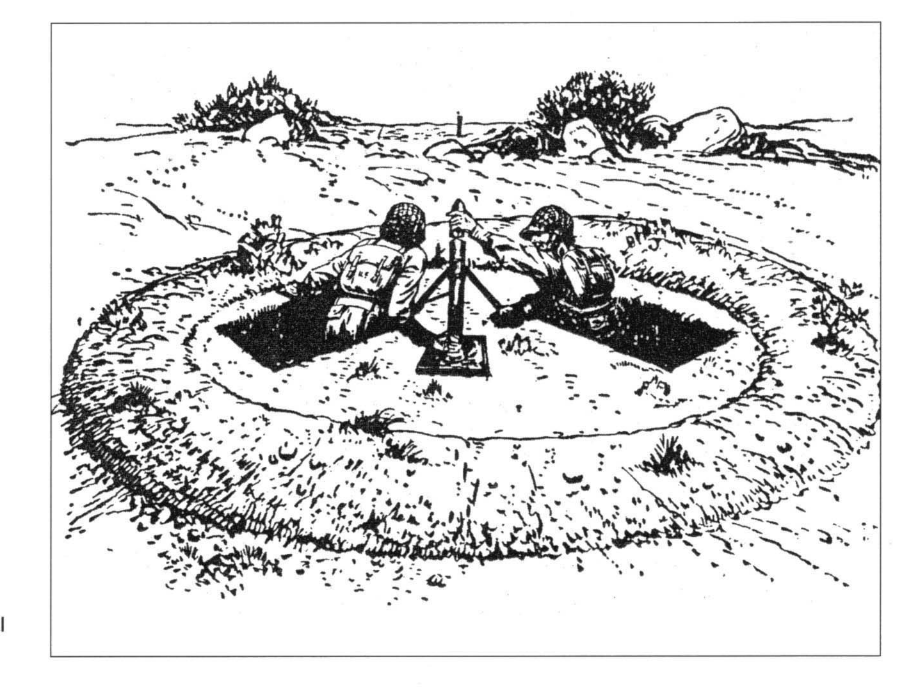
This 60mm M2 mortar emplacement was just large enough for the weapon and the gunner and assistant gunner. Mortar positions were seldom dug to the full, "by the book" depth. More often than not, any available defilade cover would be used rather than actually digging in.



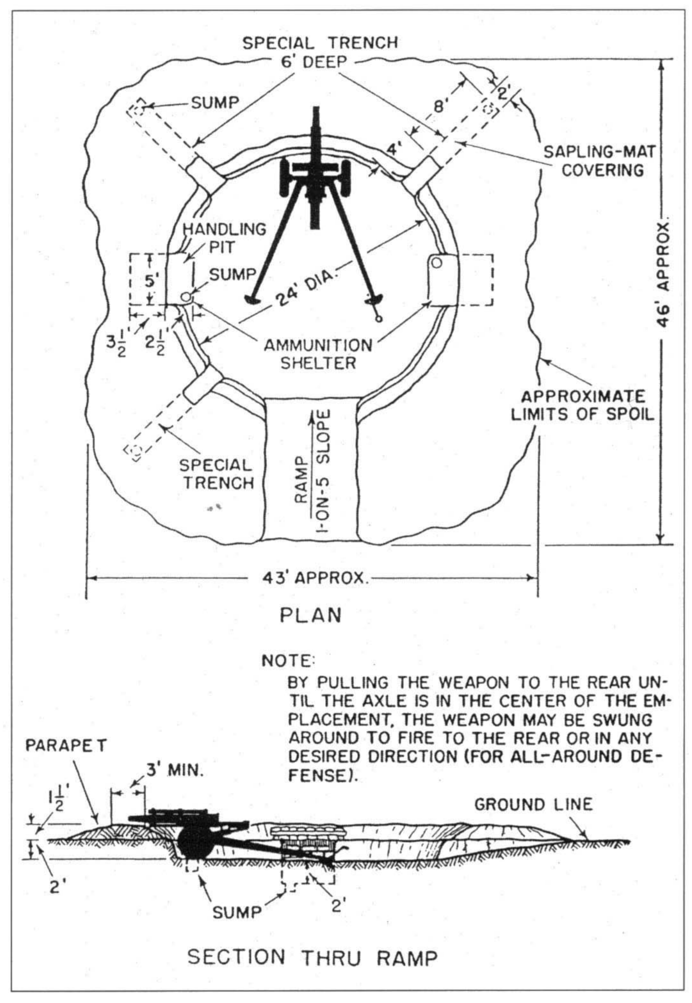
Like its light mortar counterpart this 81mm M1 mortar emplacement was just large enough to accommodate the weapon and two men. When more permanent mortar positions were constructed they were often circular, large, and had a small adjacent ammunition bunker.

between the two holes with the gunner in the left hole and the assistant in the right. Its field of fire was somewhat limited. Although the manual prescribed this position only for the 57mm, it could be used for the 75mm. The horseshoe-type emplacement for both the 57mm and 75mm RRs was similar in design and dimensions to the HMG horseshoe position except that it was reversed. The "toe" of the horseshoe faced the enemy and what was previously the front of the HMG position faced the rear. The rear wall behind the RR was well sloped to deflect the back blast and there was no parapet there. A more elaborate 75mm RR emplacement was the trapezoidal type, essentially a much-modified horseshoe

RIGHT This hasty two-foxhole type 60mm mortar emplacement could be prepared more quickly than the pit-type emplacement. It offered little protection for the weapon though.



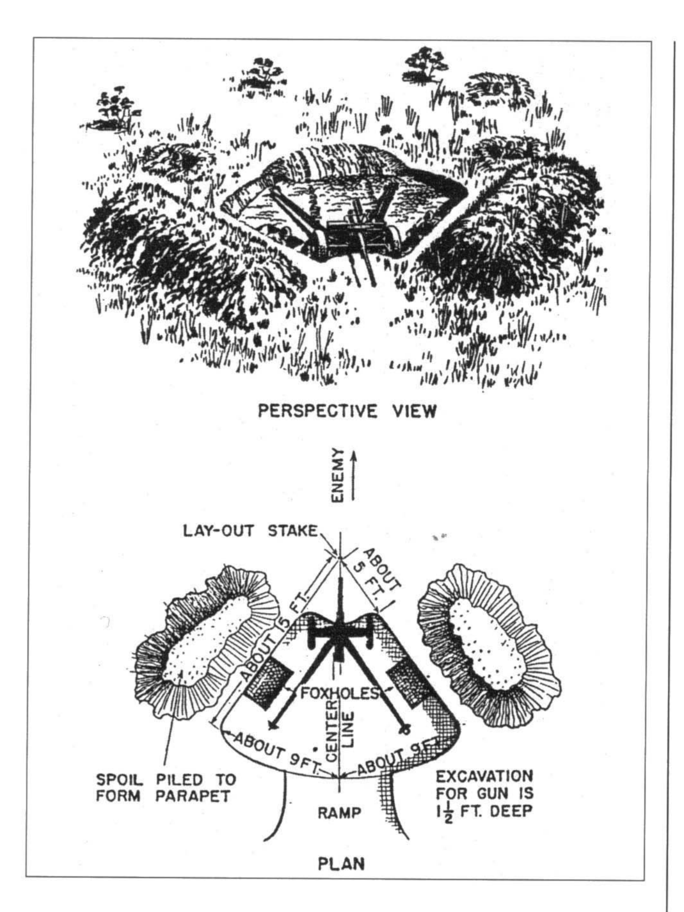
BELOW This pit-type howitzer emplacement could accommodate a 105mm M2A1 (pictured here) or a 155mm M1A1 howitzer. Ammunition storage pits were dug into the pit's sides along with special slit trenches for the crew.



type. It had a trapezoid-shaped platform, 1ft wide at the forward end, 4ft long, and 3.5ft wide at its rear. The platform was 6in. below ground level and the 2ft-wide trench was 4ft deep. The emplacement was 5ft wide across the front, 5.5ft long, and 7ft across the rear. A 1ft-wide, 2ft-long, 2ft-deep muzzle slot was cut in the forward end of the left trench to allow the entire weapon on its tripod to be set on the trench floor in the event of tank overrun. A small two-man dugout could be prepared in the right rear of the position. If the all-round parapet was kept below 1ft high the weapon could be fired in any direction. In the field RR positions were usually much simplified, often simply placed in the open, behind a hastily piled frontal parapet or some suitable natural cover. The 105mm M27 RR was normally mounted on a quarter-ton jeep, but it could be mounted on a two-wheeled M22 carriage, though this was seldom used. It relied on its mobility for survivability. When necessary it was positioned in a self-propelled weapon emplacement. All three models of RR had five-man crews.

Self-propelled (SP) weapon emplacements could accommodate SP artillery pieces, tanks, tank destroyers, SP AA guns, various halftrack-mounted weapons, and any other vehicle-mounted weapon. Natural or manmade defilade features were used when possible (ravines, depressions, hillocks, sunken roads). A manmade excavation for large SP weapons required a great deal of

effort and were usually dug with bulldozers. Regardless of the specific weapon, common construction features required a position to allow as much of the weapon's maximum traverse as possible, including 360-degree traverse for a turreted weapon. An earth or sandbag parapet, to protect the vehicle's hull, allowed enough of the weapon mounting to be exposed in order to achieve maximum depression. Sufficient clearance between the vehicle and the sides of the emplacement were also required, to allow access and servicing by the crew, as well as an exit ramp in the rear. Such positions had to be well camouflaged, as they were conspicuous. The camouflage could not interfere with the weapon's field of fire and operation. Special trenches and prone shelters were dug around the position for crew protection along with ammunition shelters. When the position was occupied for a prolonged period, close-in crew-manned defensive positions were prepared along with crew quarters with overhead cover.



This fan-type 37mm M3A1 antitank gun emplacement has one-man foxholes dug within the pit to provide additional protection for the crew. This type of emplacement could accommodate a 57mm M1 or 3in. M5 antitank gun by being enlarged.

Trenches and shelters

Trench designs were still provided for in manuals. Under certain circumstances they improved protection, communication, resupply, and evacuation. Examples where the use of trenches might be practical included:

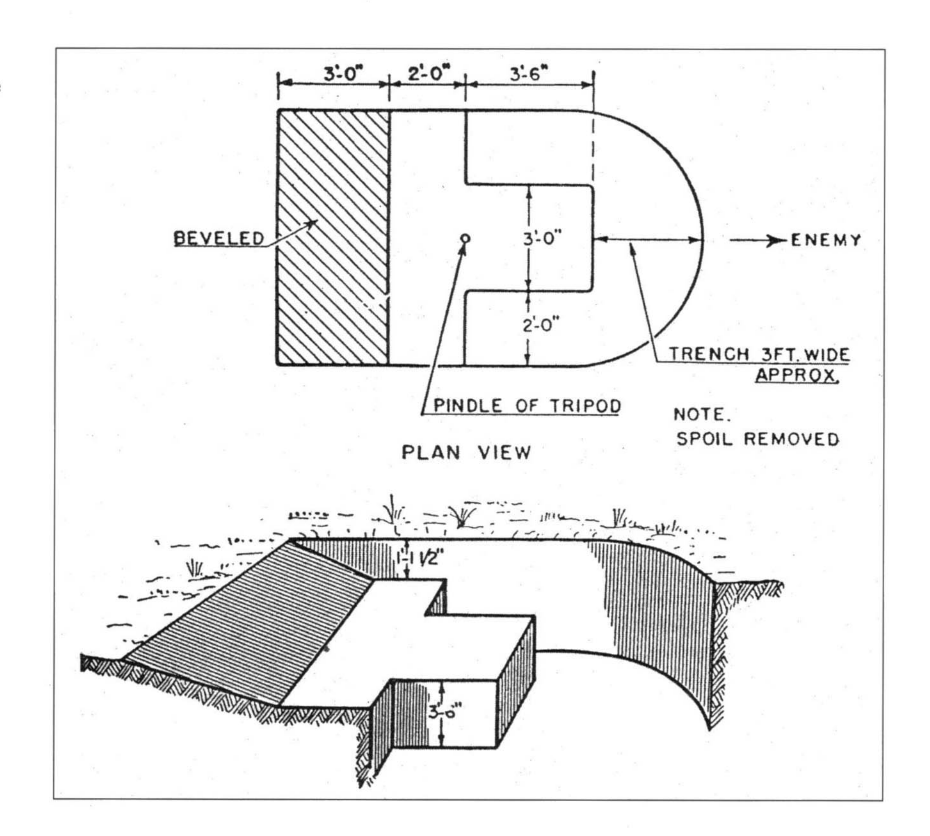
- Communication trenches in stabilized situations where either concealment was available or the advantages to be gained justified exposure (since trenches are difficult to conceal).
- Entrances and connecting trenches to shelters or groups of shelters.
- In extreme cold where soldiers, who remain in heated and protected shelters as long as possible, must be able to move rapidly to firing positions under cover.
- In jungles and forests where the movement of tanks is difficult or impossible and where the trenches are easily concealed.

Manuals called for standard trenches to be 5.5ft deep, 4ft wide at the top and 2ft wide at the bottom. The sloping sides helped support the walls, but even then revetting may have been required. 1ft-high parapets were thrown to both sides of the trench providing an elbow rest on either side. The parapets were to be 3–5ft wide. Many troops though were guided by the old soldier's entrenching credo, two shovel-fulls to the front, one to the rear. While some commanders insisted on neat, evenly spread parapets, it was learned in World War I that irregularly spread and profiled parapets made it more difficult for the enemy to detect firers.

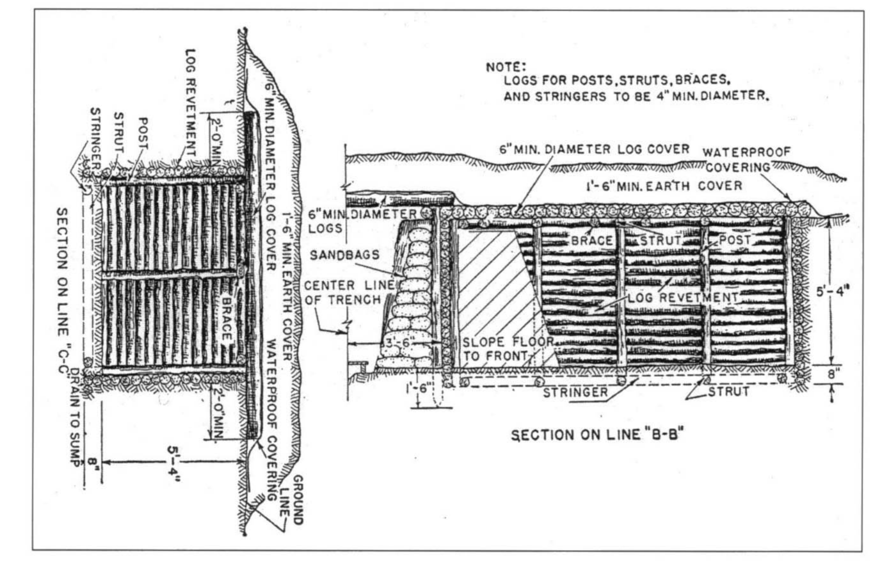
In wet weather a small drainage trough could be dug in the bottom. Trench boards could be placed in the bottom to keep it from being churned into mud. These were constructed in short sections (no more than 6ft 6in.) consisting of two 2in. × 4in. runners on edge set 10in. apart with 1.5ft-long, 1in. × 2in. or 1in. × 4in. footboards nailed on top.

Standard trenches could be used as either fighting trenches or communications (connecting) trenches. For a fighting trench, fire steps were cut into the forward side. These might be cut in the rear too depending on the

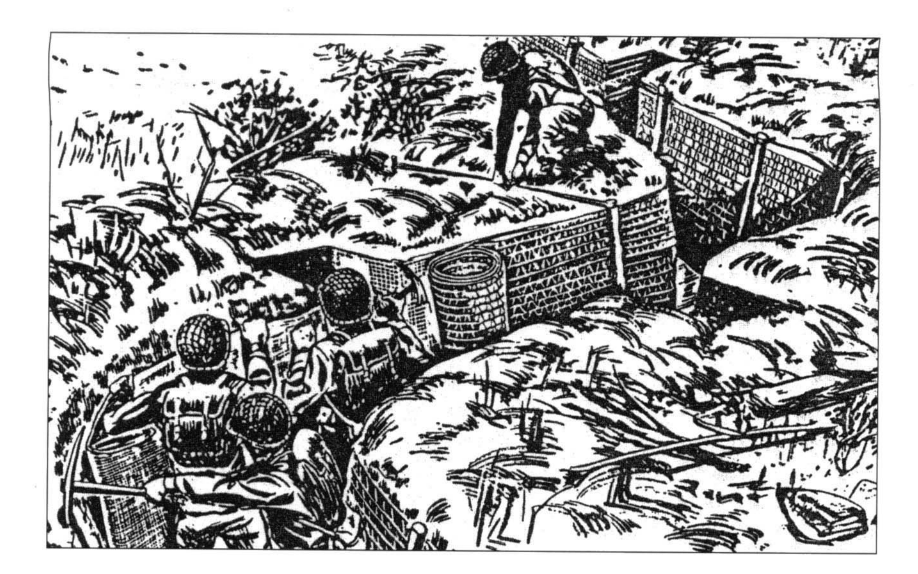
Both the tripod-mounted 57mm and 75mm recoilless rifles could be positioned in this horseshoe-type emplacement. Similar to machine-gun emplacements, it was built oriented in the opposite direction and the rear wall was beveled to prevent the back blast from being deflected into the position.



An example of a cut-and-cover shelter. This type of shelter could be used as a billet, command post, supply or ammunition bunker, aid station, communications center, and for many other roles too. The length and width were dictated by the situation. Additional roof support posts were required every 4–6ft if it was a large example. The sides could be revetted with logs, planks, sandbags, or earth-filled ammunition boxes.



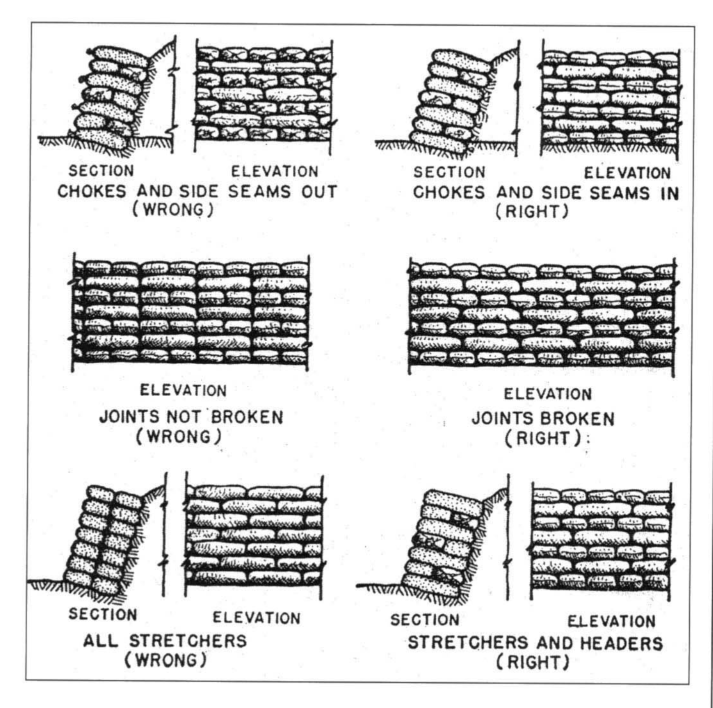
defensive fire plan and possible enemy approaches. The interval was specified as 5–10 yds, but this was actually determined by the unit frontage, available troops, and terrain. A fire step was about 4ft deep, 2.5ft wide, and cut into the trench wall 2ft. A groove for a firing port could be cut through the parapet or the soldier could simply fire over the parapet, although this forced him to expose more of his head and shoulders. Ammunition niches might be set in the side of the trench. In Korea trenches tended to be deeper, especially communications trenches, for protection from artillery. It was also a common practice to provide overhead cover on many trench segments. Even firing steps often had overhead cover and firing ports.



Revetting a trench with burlap cloth and chicken wire. Note the holdfast wires being emplaced to retain the support posts. Firing steps have been cut into the trench wall.

World War I-like geometric trench patterns were discouraged. They followed natural terrain contours, used irregularities in the ground and available vegetation for concealment. They were still required to have curves and turns to prevent an artillery hit from causing casualties in a long straight section and to make them a more difficult target. Sharp turns in trenches had to be widened to allow litters to make the turn. Troop shelters, CPs, aid stations, and crew-served weapons emplacements were positioned as required along trench lines.

When smaller trenches were required to connect forward fighting positions, crew-served weapons emplacements, and other frontline positions, crawl trenches could be dug. Minimal dimensions for a crawl trench with the spoil removed were 3ft wide across the top, 2ft across the bottom, and 2ft deep. With 6in. parapets on either side, they could be 2.5ft across the top, 2ft across the bottom, and 1.5ft deep, exclusive of the parapet.

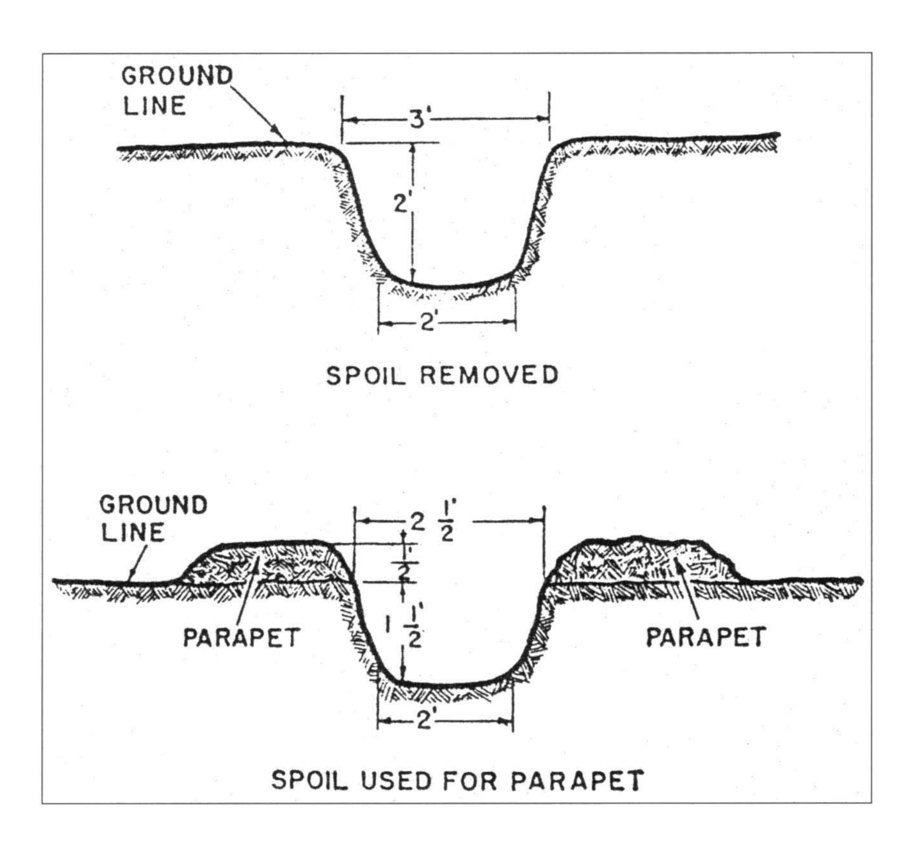


The right and wrong way to stack sandbag revetments. In practice they were more usually incorrectly stacked, often haphazardly.

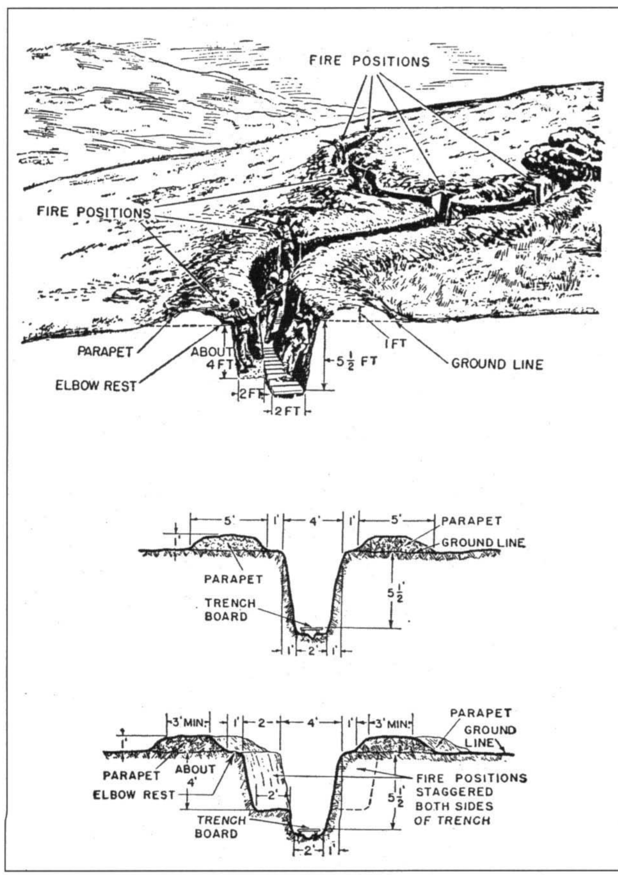
To protect artillery crews and personnel in rear area installations "special trenches" were provided. These could be short, straight slit trenches or V- (chevron), Z-, and Y-shaped to accommodate two to four men or more. The "letter-shaped" trenches were more effective than longer straight or zigzag slit trenches as they required less room and could be concealed under the same camouflage net erected over artillery positions or other net-camouflaged installations. The arms of each special trench could be as long as necessary to accommodate the required number of crewmen in the space available. Usually the arms were no more than 3–6ft long. They were about 2ft wide and from 3ft to 5ft deep with parapets piled on either side. The sides were vertical, if soil stability permitted, so as to present as small an area as possible to airbursts and strafing.

Little in the way of plans and instructions were provided for troop shelters that could be easily constructed in the forward areas by combat troops. Plans

RIGHT Crawl trenches were used to connect forward foxholes and crew-served weapons emplacements. The minimum dimensions are shown, and these offered little protection. They could be dug deeper for better protection and to allow one to move on hands and knees, a better option than belly crawling. They could be deepened to standard trenches if the position was occupied for long enough.



BELOW The standard trench normally followed natural contour lines. Gone are the geometric patterns of World War I. Duckboards can be seen in the bottom of these trenches, although they were not used to keep feet dry as the trenches would still flood with water over the duckboards. However, they did prevent the bottom from being turned into a churned-mud quagmire.



were available for more elaborate shelters requiring engineer support. These were designed to be constructed in the rear areas of the combat zone and used corrugated steel, steel culvert pipe sections, and a great deal of dimensioned lumber. They were usually of the cut-and-cover-type.

As a result troops in forward positions for a prolonged period were left to their own devices and imagination. They built dugouts, small cut-and-cover shelters, cave shelters, and small surface bunkers from logs, sandbags, earth-filled ammunition boxes and fuel drums, and rocks, often reminiscent of World War I or even the American Civil War. Any available local, salvaged, or scrounged materials were used.

During the defensive battles in Italy these types of positions were essential for protection from the cold, wet weather and mortar and artillery fire. They were usually constructed with rock walls roofed over with logs, waterproofed by cardboard ration boxes, shelter-halves or tarps, with layers of rock piled on. They were often precariously perched on ledges and in narrow ravines on the steep reverse slopes of mountains.

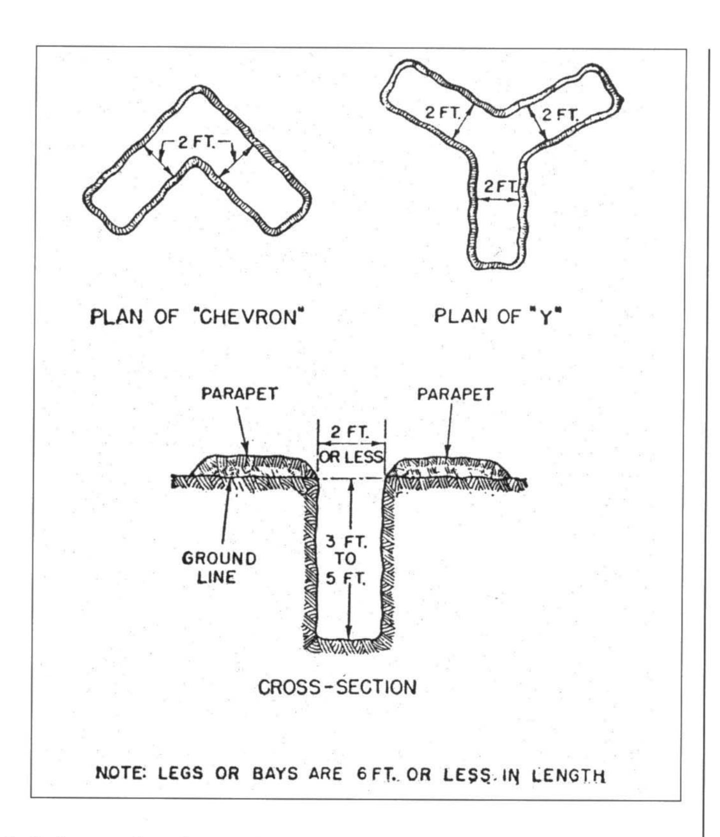
More often frontline troops lived in the fighting positions making do with shelter-halves, ponchos, wool blankets, and sleeping bags as their only shelter. Light overhead cover was often placed over foxholes and slit trenches to provide some protection from the weather and artillery

airbursts. This was especially important in forests where tree bursts were a serious danger to troops in open-topped positions. 18in. was considered to be the minimum thickness, but often much less was used.

Obstacles

US forces made little use of obstacles because of the high-tempo offensive operations. Even when a prolonged defense was established the use of obstacles was somewhat limited. During the latter stages of the Korean War antipersonnel obstacles were extensively employed in the defense of hills and ridges.

The basic principles of obstacles required that they be kept under observation, covered by fire, concealed to the maximum extent possible (emplaced on low ground or reverse slopes, hidden among vegetation, or following natural contour lines), that geometric patterns be avoided, that they did not provide the attacker cover and concealment, and be simple in design requiring minimal construction time and resources. Obstacles provided all-round protection if possible, but this could not always be accomplished. In such cases obstacles were emplaced on the most dangerous approach. If continuous obstacles were possible, additional belts or bands might be emplaced on the most likely avenues of approach; they were not necessarily of equal density. The use of manmade obstacles was integrated with natural obstacles and tied into minefields. A problem with the use of obstacles not always appreciated is that no matter how well defensive positions are concealed, the presence, location, and pattern of obstacles aid the enemy in locating defensive positions.



Special trenches were designed to be dug within or adjacent to large crew-served weapons emplacements, such as artillery and AA guns. Rather than digging long slit trenches for protection, special trenches covered a smaller area and could be hidden under the camouflage net concealing the gun emplacement. The arms could be longer if necessary and there was also a Z-shaped special trench.

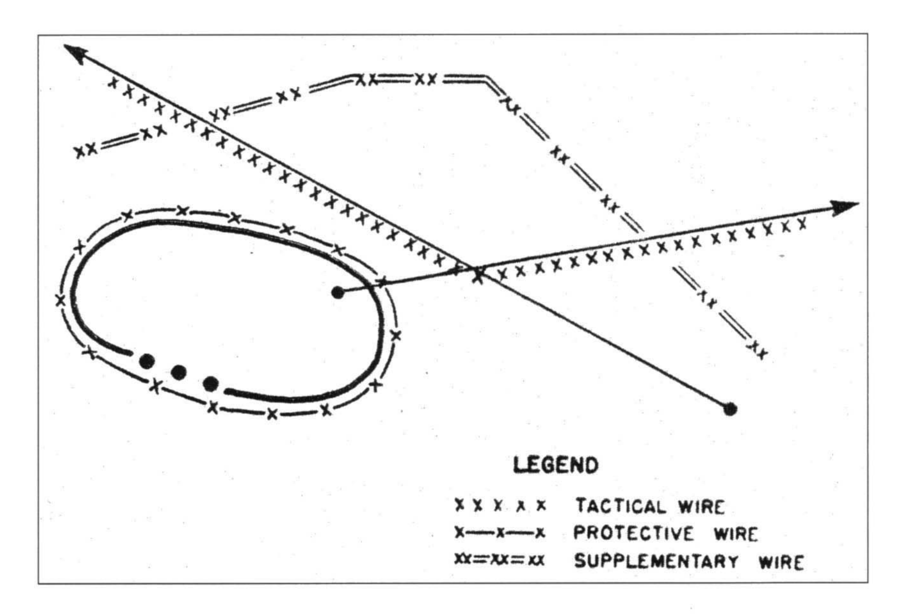
Obstacle materials

Standard US barbed wire was a double-twisted strand of No. 12 wire with four-point barbs at 4in. intervals. The barbs were only 0.5in. long, shorter than European military barbed wire. Captured barbed wire was often used by US forces. Barbed wire was issued in 100 lb, 420yd spools. Wire bobbins were fabricated from a 40–46in. long, 1.5in. to 2in. round or square lengths of wood with a 12–14in. crosspiece 6–8in. from both ends. Up to 30 yds of wire were figure-eight rolled on the bobbin for easier stringing. Wire was strung loose to make it more difficult to climb and cut. Certain strands did have to be taut to provide adequate support or anchoring.

Concertina wire had to be fabricated in rear areas. This was a complex and time-consuming task resulting in it seeing little use. It required 100 yards of barbed wire to fabricate a single 4ft-diameter, 20ft-long section of coiled wire barrier. One advantage of concertina was that it was easily recoverable, and could be compressed into a roll and reused. Prefab spring-steel concertina with 0.75in.-long barbs was introduced at the end of the war and used in Korea. Prefab concertina rolls were 3ft 4 in. in diameter, 50ft long extended, and weighed 55 lb.

Locally cut wooden barbed wire picket posts were 2.5in. to 4in. in diameter, and of the necessary length. Issue pickets included the World War I screw-type, V-shaped angle iron, and the newer U-shaped metal pickets. These were provided in various lengths and possessed slots on the edges for attaching wire.

This rifle platoon defensive position is surrounded by protective wire with tactical and supplementary wire strung across its front. The location of the protective wire is somewhat misleading in that it was necessary to place it outside of hand-grenade range (40–50 yards).



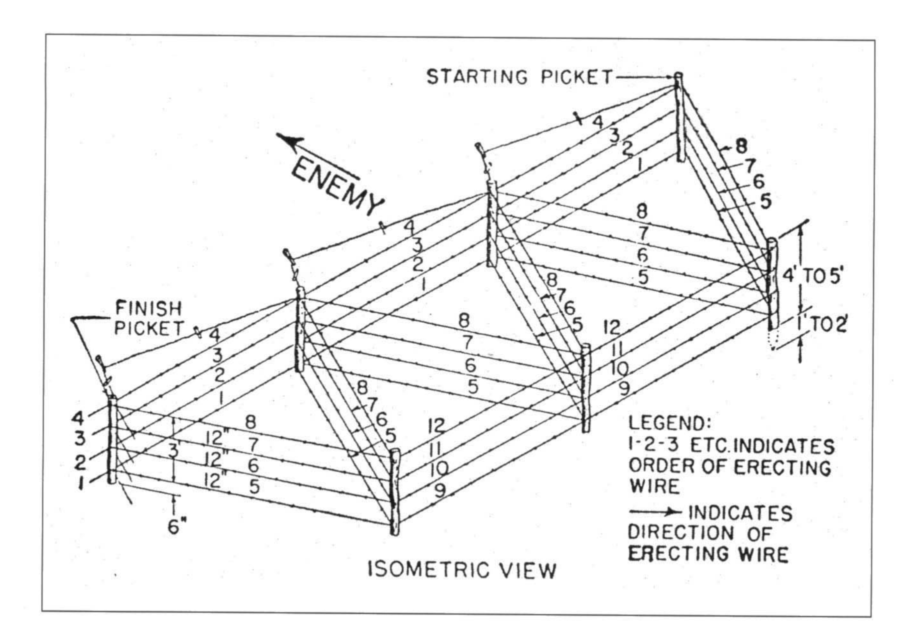
The short pickets were used for anchor wires. Screw pickets had looped eyes for attaching wire. Angle iron and U-shaped pickets were lighter to ship, less costly, and easier to emplace than screw pickets. The advantage of screw pickets was that they could be relatively quietly screwed into the ground, with the aid of a metal rod inserted through the bottommost eyelet, rather than hammering them in. They were more resistant to uprooting and shearing by artillery fire. The exposed height of picket posts was 3–4ft placed at four-pace (10ft) intervals.

Material for AT obstacles was required to be robust and necessitated the use of engineer troops with powered equipment. Large-diameter logs and steel rails were the most commonly used materials in the rare instances these obstacles were constructed.

Types of obstacles

Manmade obstacles were categorized as antipersonnel and antitank. Antipersonnel were primarily barbed wire. The two types of wire obstacles were tactical and protective. Tactical wire was intended to break up attack formations. Protective fire was placed outside these barriers. Machine gun final protective fire were sited to fire laterally across the enemy side of entanglements in crisscrossing lines. Protective wire was usually less dense than tactical wire. It could be emplaced on the flanks and rear to prevent surprise attacks and infiltration as well as to the front, inside the tactical wire, to hamper the final rush or hold the attackers outside hand-grenade range. The two roles could be combined if the entanglement was skillfully located and designed. A "belt" was a line of any type of wire. A "band" consisted of two or more belts emplaced in depth with no significant distance between the belts. A "zone" consisted of two or more belts placed in depth no more than 15–40 yds apart. Narrow gaps were left in the wire to allow patrols and work parties to pass. These were usually blocked by portable wire obstacles and followed a zigzag course through belts. They were kept under close surveillance, sometimes booby-trapped, and periodically changed.

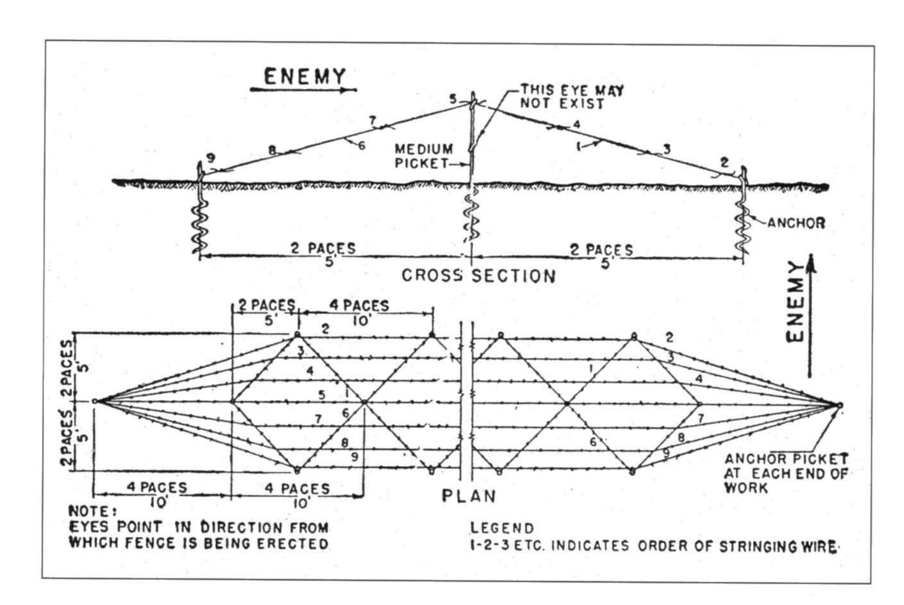
The most basic wire fence was the four-strand "cattle fence"—four horizontal strands on 4ft pickets. This could be used for protective wire, sometimes reinforced with a coil of concertina on the enemy side. A single coil of concertina was also an effective protective barrier. The cattle fence was the basis for more elaborate entanglements. The double-apron fence was a cattle fence with anchor wires in a V pattern on both sides. Across the anchor wires on both sides were three horizontal strands presenting a sloping barrier (the



The high-wire entanglement comprised two parallel cattle fences with a zigzag pattern of wire strung between them. Any of these entanglements could be reinforced by coils of concertina wire on the forward (enemy) or rear sides, or on top.

aprons). A low-wire fence was essentially the same but with only two strands on the vertical fence. A high-wire entanglement was two parallel cattle fences about 10ft apart with the pickets staggered. A zigzag four-strand fence connected the two rows of alternating pickets. Any combination of these engagements, possibly reinforced with concertina, could be used to construct bands of barbed wire obstacles. Tripwire was barbed wire strung tightly in a zigzag pattern a few inches off the ground. This was sometimes strung between and among entanglements. It was most effective if concealed in grass and helped break up the attacker's final rush.

AT obstacles were seldom constructed because of the time required and constant movement. The US relied largely on AT guns, bazookas, artillery concentrations, and the mobility of tanks and tank destroyers to defeat enemy armor. AT minefields, with a sprinkling of antipersonnel mines to hamper breeching efforts, enemy patrols, and infantry accompanying tanks, were sometimes used. Road cratering with demolitions, and blown bridges and culverts were common.



The low-wire entanglement also had sloped strands of wire on both sides, but the central vertical fence had only two strands. It could be erected quicker than the double-apron type.

Theater specific defenses

North Africa

The initial seven US divisions landing in Northwest Africa in November 1942 found themselves in a totally alien environment. Most of these divisions had trained in the northeastern or southern United States and had undertaken no desert training. Most of the fighting occurred on the coastal strip extending up to 50 miles inland. This region is predominated by undulating ground crossed by ridges and hills with gentle to moderate terraced slopes. The high ground is covered with exposed rock, much of it loose, and the wide, flat valleys feature rocky ground covered by chalk, clay, and dust. In some areas broad *wadis* (dry watercourses edged by low banks) cut the ground.

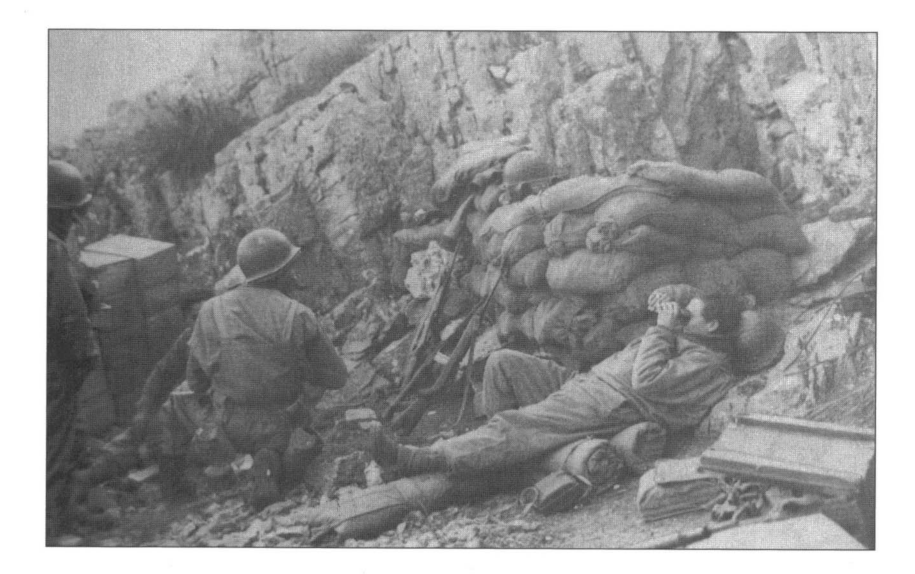
Every foot of elevation provided an advantage for observation, fields of fire, and cover. The lack of vegetation and significant high ground in some areas made camouflage a challenge. *Wadis* were valuable for concealing units, vehicles, and positions, as were the reverse slopes of low ridges. Camouflaging positions and vehicles was impossible in most areas. Dust clouds and vehicle tracks made it even more difficult. Camouflage nets and brush were used to conceal vehicles, the nets also providing a degree of shade. Barbed wire and manmade obstacles in general were little used because of the lack of materials, the wide frontages, and the ability to outflank positions. Extensive antitank and antipersonnel minefields were relied on as obstacles.

In Tunisia, where the heaviest action occurred, the hills and valleys were rocky and barren. Sandbags (in short supply), rocks, sand-filled ammunition boxes, and fuel drums were used for revetting. Where positions could not be dug in, rocks were simply stacked in low circular walls for cover: this emplacement was called a *sangar*, a Kashmiri term widely used by the British since the days of the North-West Frontier. Unless made to appear like a natural rock pile, they were easy to detect at moderate ranges. Materials and suitable terrain for constructing overhead cover were not available, except in the bottom of *wadis*. Tents and shelter-halves were pitched over prone shelters and slit trenches so that the occupants slept below ground level and had protection from the sun and nighttime cold. Desert haze, dust, and ground glare all served to conceal positions at longer ranges. In areas where the positions were shallow, defenders had to remain motionless all day under the blistering heat and swarming flies—with many suffering from dysentery.

Further to the rear, slit trenches were dug for protection from artillery and air attacks, and more elaborate and more comfortable shelters were constructed. Again, materials for overhead cover were virtually non-existent. Pup tents, larger tents, and tarps or cargo truck covers were pitched over holes usually dug 3ft deep. Often the sides were lined with blankets to keep down dust, and rug mats were sometimes used for lining the walls and floors. Stools, tables, and chairs were made from ammunition boxes, while electrical lights were jury-rigged from radio and vehicle batteries.

Italy

Southern Italy is rocky and mountainous, and the peninsula is cross-compartmentalized with narrow, flat river valleys that become muddy in winter and spring. The towns and villages provided good defensive positions for the enemy, and AFVs were restricted to the easily blocked roads, leaving them exposed when approaching towns. While mutual support between

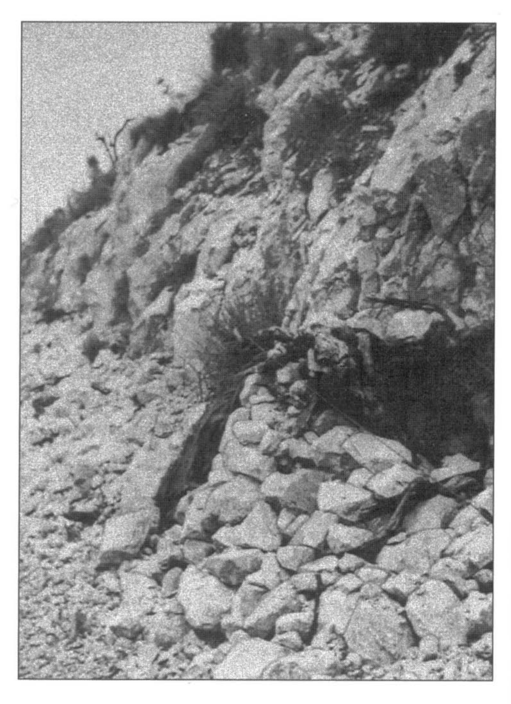


A rifle company reverse-slope command post built of sandbags in Italy. Rather than being dispersed, supply and ammunition points tended to be consolidated at the CP to ease distribution. Note the ammunition crates in the right foreground and ration boxes in the left background.

fighting positions was desired, the terrain was often too rough and too many positions were required to block every avenue of approach. Antipersonnel mines were used extensively and AT mines could easily block roads, as did demolitions. While the mountains and ridges provided the defender with excellent long-range observation, clouds, fog, rain and snow permitting, fields of fire and observation in the immediate vicinity of defensive positions were usually limited. Surprise attacks and close-range fights were common.

Rock was the most commonly used material for fighting positions, dugouts, and other emplacements. Rock-built fortifications hidden among the scrub trees blended easily into the surrounding terrain and were difficult to detect. The Allies were able to use some captured German positions. They may have been oriented in the wrong direction, but they could still be used for cover.

Defenders made use of ravines, gullies, knolls, and ground folds since digging was difficult to impossible. Blasting was required to excavate many positions. Rock *sangars* were extensively used and these too were sometimes covered with logs and rocks. Mortars proved to be especially effective in the short-range battles as their steep trajectory allowed them to reach into ravines and behind steep ridges. Shelters were often built on the reserve sides of ridges.

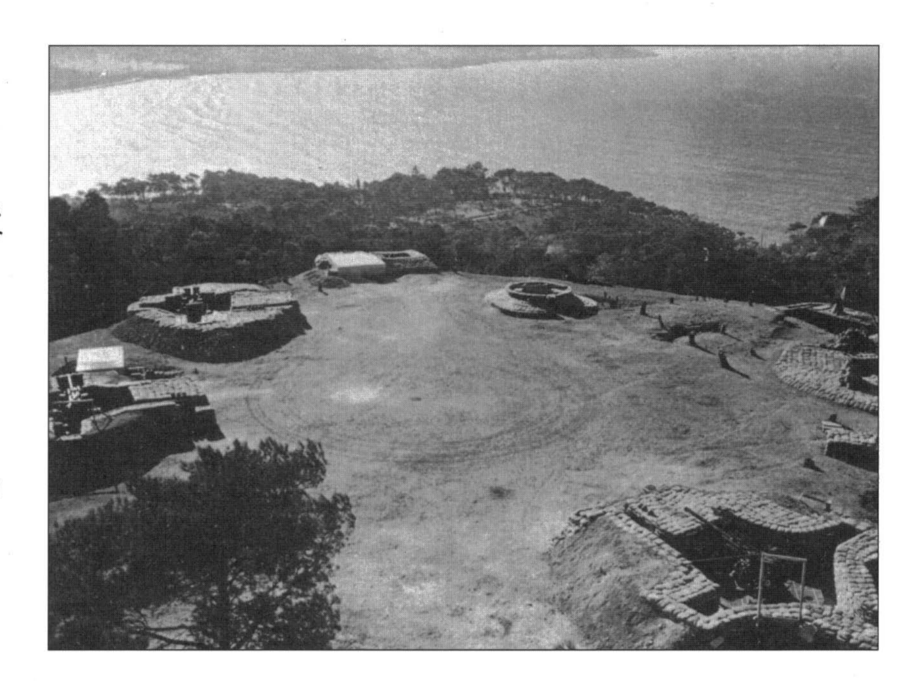


A typical two-man rock *sangar* position in Italy. This one has partial overhead cover of logs and rocks. Such positions were difficult to detect at long range, but on closer inspection the piles of rock did not appear natural and could be easily picked out.

During the winter of 1944/45 the Fifth US Army made major efforts to improve the comfort of the frontline troops and winterize their quarters via waterproofing and heating. Trench foot was common in the cold, wet conditions. One-burner M1941 and M1942 gasoline stoves were used for this purpose. For larger shelters M1941 tent stoves complete with stovepipes, which could burn wood or coal, were provided. Tarps were also widely issued.

Northwest Europe

During the fighting in France, the Netherlands, Belgium, and Germany (for the most part comprising gently rolling terrain), the weather was generally mild, but periods of heavy rain and cold winters hampered operations and made for miserable conditions in defensive positions. A major factor affecting defensive operations was the large numbers of towns and villages scattered over the countryside. Houses and other buildings were robustly constructed of stone



This battery of four 90mm M1A1 AA guns on the southern French coast is a good example of a carefully constructed position virtually devoid of camouflage. While neat and orderly, such a position is easy to spot from the air. The tracker for the M9 gun director is located in the circular position in the upper center and a van-mounted SCR-584 fire-control radar is located just above the upper right gun on the edge of the photo. Tree stumps between the tracker and radar have been cut down to give both instruments unrestricted coverage, rather than leaving the trees for camouflage and positioning the equipment in less conspicuous locations.

and masonry, and the many rivers, streams and canals, sometimes running through towns, made good AT obstacles.

There were frequent occasions when the Allies went on the defensive in some sectors, especially in winter. If possible, the defense was established along rivers, canals, and high ground, and nighttime-halt positions were established in villages, towns, and wooded areas. A platoon would occupy a small group of buildings and settle down for the night, and a couple of outposts would be established in outbuildings or on possible avenues of approach. Often, defensive positions were established in woods or in the open as the tactical situation required, and were generally set up as specified by doctrine. However, the limited German counterattacks and the superior nature of US firepower meant that effort and coordination were often curtailed.

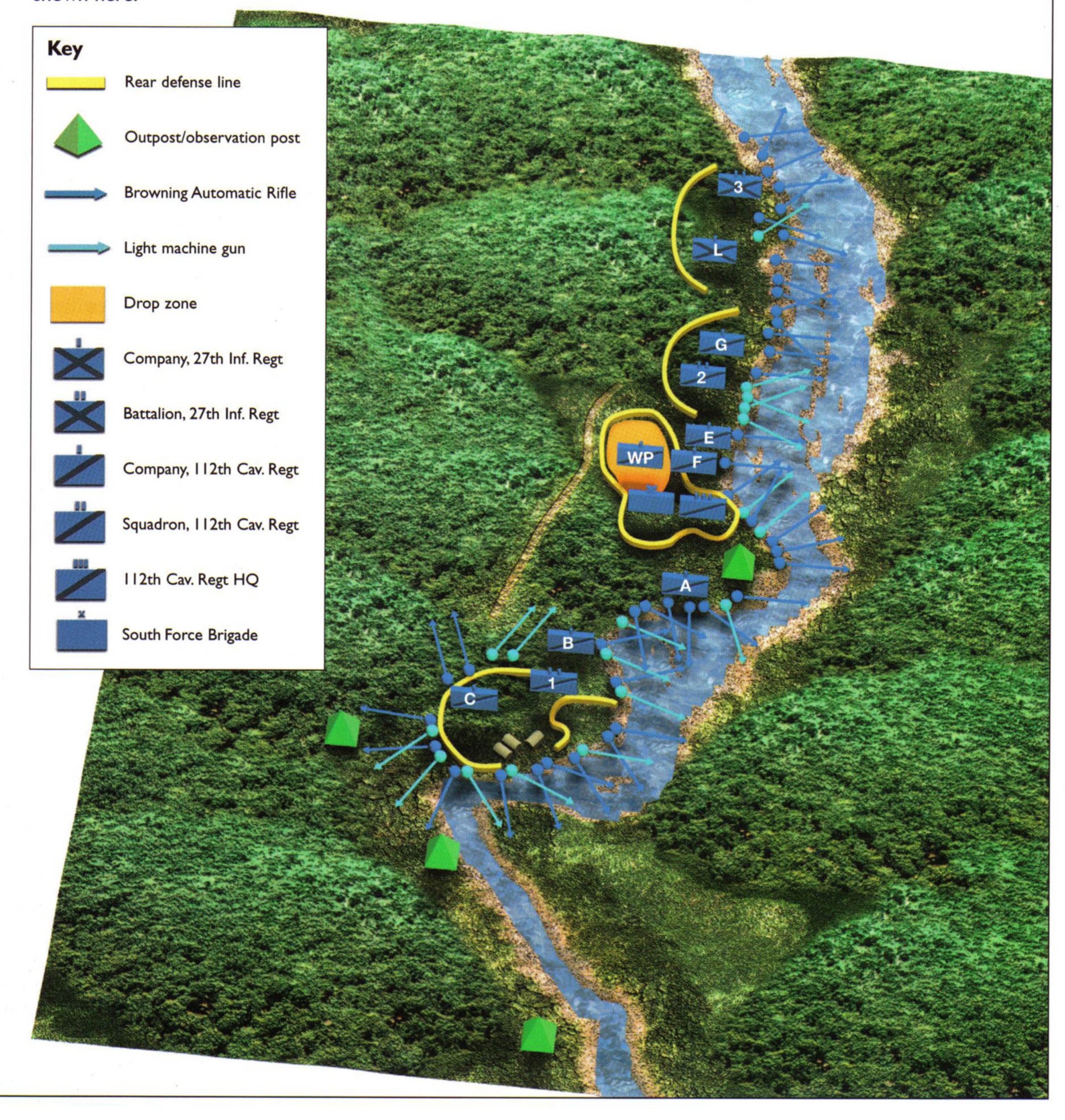
The Pacific

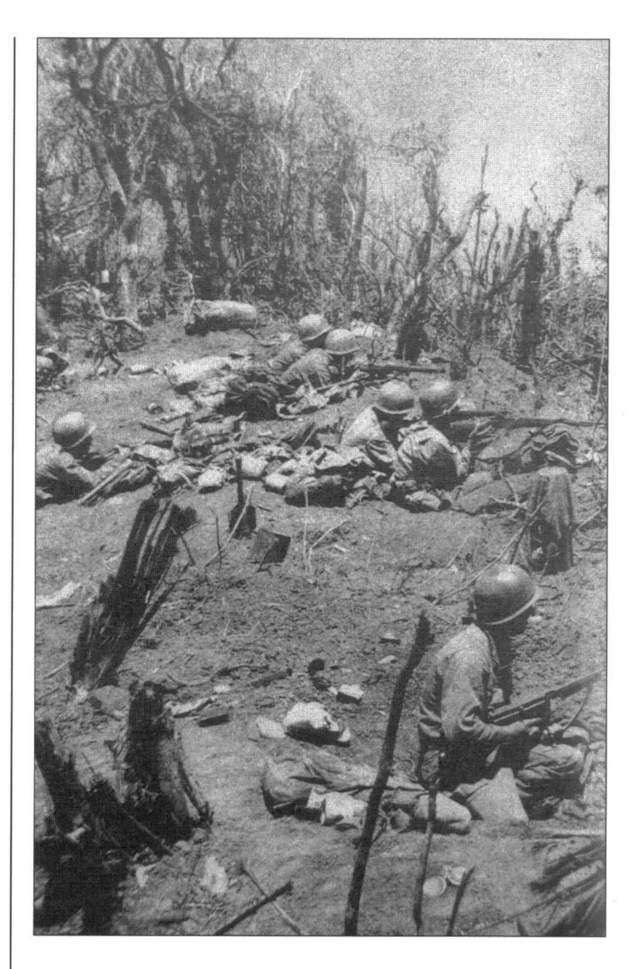
Pacific islands varied greatly in terrain and vegetation. On the large, mountainous islands covered with dense jungle, such as the Solomons and New Guinea, defensive operations seldom occurred more than a few miles inland, and on easier terrain. In the Solomons, for example, the Marines and Army reinforcements established a coastal airfield at Henderson Field on Guadalcanal and then defended the perimeter for many months. The islands of the Central Pacific were different. The circular atolls comprised varied numbers of small islands and islets, often only a few feet above sea level. Defendable terrain features were non-existent. US troops undertook little defensive action on these islands, which were cleared in a few days or even hours. The islands of the Western Pacific were fairly large, hilly, and very rugged in some areas. Vegetation could be dense in some areas and sparse in others. Frequently there were large cultivated areas. They were often riddled with caves, ravines, and sinkholes. Unlike the Solomons, these islands had to be cleared entirely.

Abundant local materials (such as coconut and hardwood) were vital for defensive construction: few imported materials were available. Sandbags and barbed wire were the most common materials issued. Coconut palms are easy to cut, and their soft and fibrous interiors make them resilient to the impact of projectiles and less able to cause serious wounds through splintering. With age though, coconut logs become spongy and weak. Numerous species of

Defense of the Driniumor River, New Guinea

The Persecution Task Force had landed at Aitape on Northeast New Guinea on April 22, 1944. The Japanese 18th Army was retreating westward and would run headlong into the Task Force in July. The 112th Cavalry Regiment (consisting of only two battalion-size squadrons, much smaller than infantry battalions); 3d Battalion, 127th Infantry; and 2d Battalion, 128th Infantry established a thin defense line on the Driniumor River 15 miles east of Aitape. While the river provided a 150yd-wide field of fire, it was only inches deep. The sector depicted here, from north to south, was defended by 3d Battalion, 127th Infantry; and 2d and 1st squadrons, 112th Cavalry. After two weeks of sparring with Japanese advance patrols, the 20th and 41st divisions attacked on July 10. They penetrated several sectors, but the line was restored on July 18. For the remainder of the month the Japanese conducted repeated attacks on the exposed south flank. The Japanese lost 8,000 men and the Americans 450. This diagram depicts the US positions on July 21 at the height of the south-flank attacks. Because of Japanese infiltration, lines of riflemen were established to the rear of the river defense line facing west. The locations of machine guns and BARs are identified, as are the rear defense lines. Note that the positions and sectors of fire of all available BARs are not shown here.





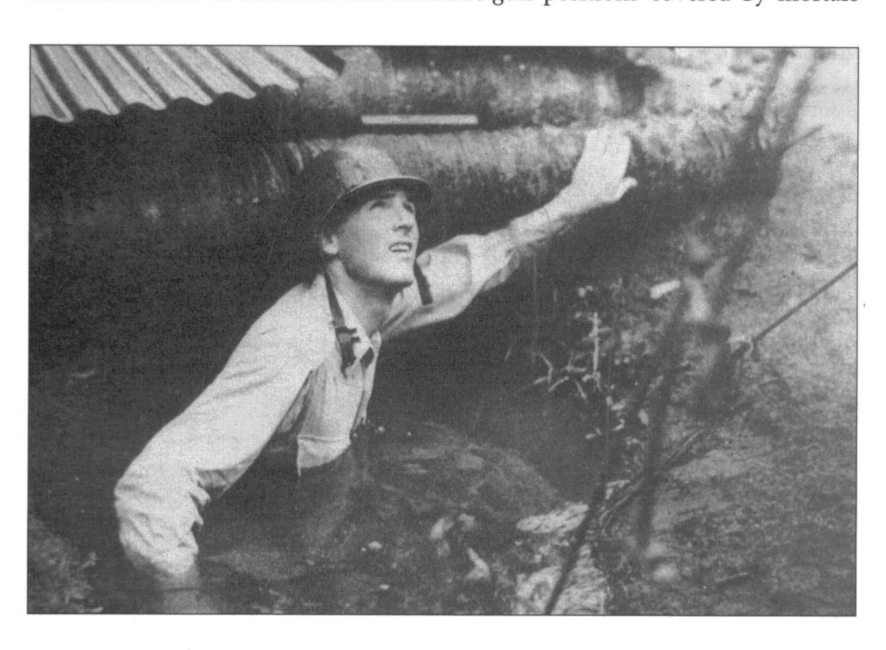
Troops dug into hasty positions atop a ridge in the Philippines. Some of these were improved shell craters. These were typical of hasty, overnight, frontline positions.

hardwood trees were used for fortification and obstacle construction. Ironwood (Casuarina) was common providing a difficult to work, but exceptionally tough material. Engineer units would set-up sawmills and provide dimensioned lumber.

Wooden ammunition and ration boxes and fuel drums of all sizes were often filled with sand and stacked brick-like to form interior walls of emplacements, braced with posts. Even in the Solomons, the defenses were temporary and simple. Perimeters were constantly adjusted and expanded to secure favorable terrain and keep the enemy off balance. Infiltration by small groups was a continuous problem made more difficult by dense vegetation. In-depth defensives were seldom established, other than as thin second lines to catch infiltrators. Some units were tasked to establish defenses along the beachhead's water's edge; Japanese counterlandings were common. Coast defense, AA, AT, amphibian tractor, and engineer units were employed for this purpose along with infantry and reconnaissance units. AA and AT guns were especially effective in this role as antiboat guns.

Army and Marine Corps attacks would always halt at night, and establish defensive positions before continuing in the morning. The reasons were the risk of by-passing enemy holdouts and of causing friendly casualties, and the difficulty of directing artillery and mortar fire at night. Both forces learnt the hard way that the night defense had to comprise a continuous line of foxholes. A series of platoon strongpoints on the MLR with support platoons in the rear for counterattacks was dangerous. The Japanese would simply by-pass the forward positions infiltrating through gaps concealed by rough terrain and vegetation, and attack vulnerable rear areas.

The MLR, extending all the way across the island, had to be defended by a continuous line of foxholes and machine-gun positions covered by mortars



High water tables and heavy rain were not conducive to creating dry bomb shelters. When Japanese bombers appeared, though, any hole was acceptable. This special slit trench is covered with coconut logs and sheet metal.

and artillery. AT guns and bazookas were positioned on likely tank avenues of approach, although Japanese armor was not a major threat. US tank platoons were usually positioned relatively well forward in defilade positions to respond to major breakthroughs of tanks or infantry.

The order to halt the advance was to be given while there was at least an hour of daylight left. If darkness fell, they found themselves attempting to dig foxholes, assign sectors of fire, emplace early warning devices, coordinate with adjacent units, register artillery and mortar fires, and resupply in the dark. Two-man, and in some cases three-man foxholes, were dug with every available man and machine gun in the line to cover a unit's assigned sector—an increasing problem as companies dwindled in strength. Once the holes were occupied no one left them for any reason. Anything that moved on the ground was targeted. Illumination was fired all along the MLR for the entire night, from either the artillery or from Navy 5in. star shells.



A 77th Infantry Division rifleman on Guam clips rounds for his M1 rifle. An M1910 T-handle entrenching tool rests on the hole's edge. This shows another non-standard foxhole, wide enough and long enough for two men to sleep in, and shallower than specified. The soil was usually too hard to dig deeply into.

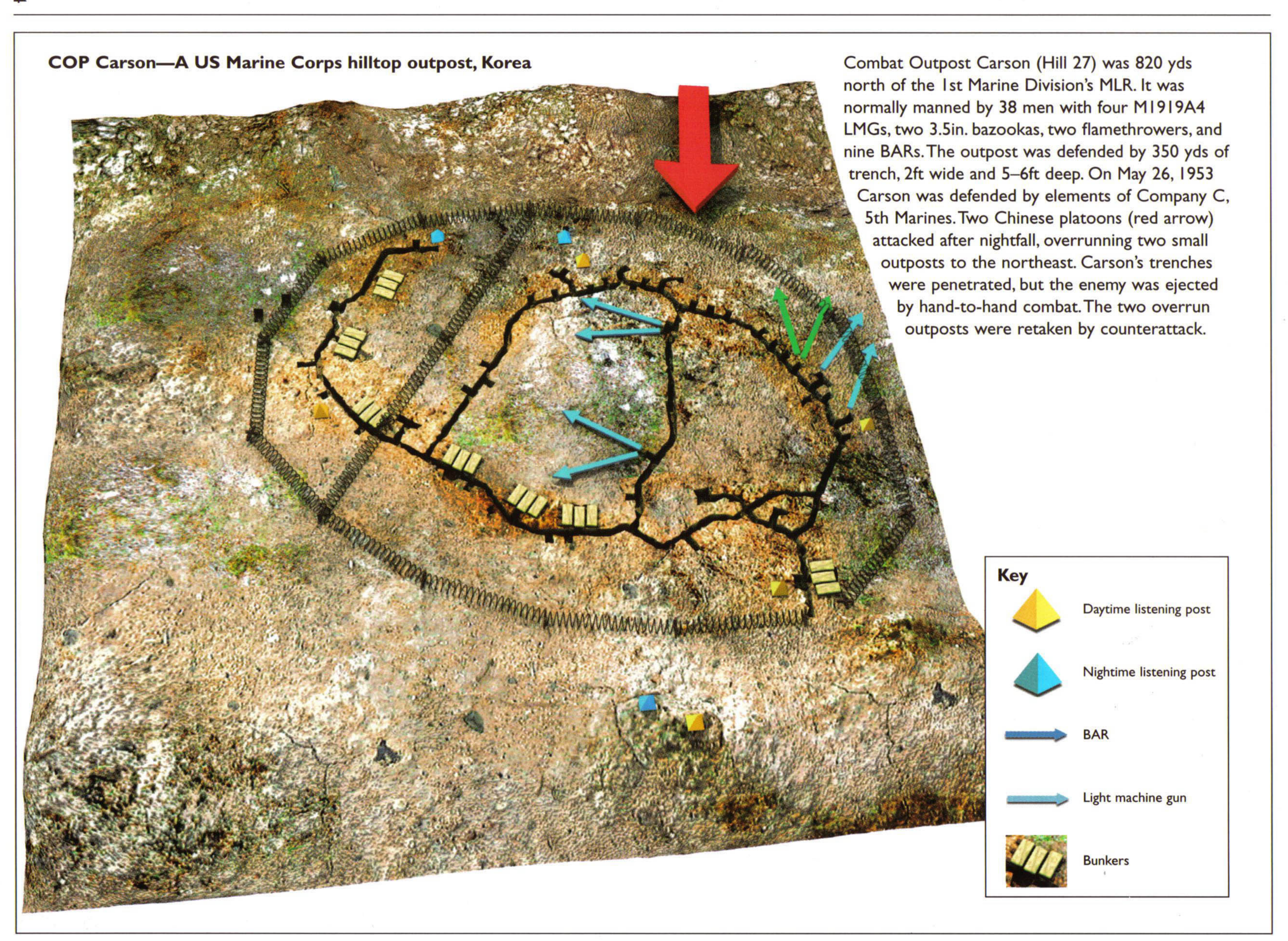
Korea

Korea is an extremely mountainous country experiencing harsh weather extremes. Scattered brush and scrub trees cover much of the steep, rocky hills and ridges. Large, forested mountain areas are present in the southwest, central eastern area, and much of the northeast. The narrow valleys provide canalized movement and most level areas are occupied by rice paddies. While there are some large rivers, much of the country is drained by smaller rivers and streams. Easily blown bridges and culverts crossed these obstacles. AT mines easily blocked the narrow valleys. The summers are hot and dusty and the winters bitterly cold with heavy snow.

The initial phase of the Korean War, June to August 1950, saw UN forces in retreat. This was followed by the defense of the Pusan Perimeter until the UN broke out in September and pursued the North Koreans well into North Korea. The Chinese attacked in October and again UN forces were pushed south. The UN was able to regain some ground and the front was largely stabilized in the summer of 1951 more or less along the original 38th Parallel boundary. On November 12 the UN Command ordered offensive operations to cease because of on-going cease-fire talks. From that point until the July 1953 cease-fire the war was largely one of static defense with limited attacks to secure or recover advantageous terrain.

This phase of the war saw World War I-like defensive works running along a 155-mile coast-to-coast frontline over hills and ridges, although they were thinly held in some areas. Mobile reserves were relied on to block breakthroughs and counterattack enemy penetrations. Division frontages could be as much as 60,000 yds, considerably more than the norm. Regiments might have had 3,500–5,000-yd frontages, even up to 10,000 yds. All three regiments had to be in the line in such instances. Companies could be assigned 1,200–2,000-yd sectors, although only a small portion of these were physically occupied. Fire, outposts, and patrols covered the rest. Attached UN battalions or regiments augmented most divisions to help cover extended frontages.

COP Carson—A US Marine Corps hilltop outpost, Korea



Combat Outpost Carson (Hill 27) was 820 yds north of the 1st Marine Division's MLR. It was normally manned by 38 men with four M1919A4 LMGs, two 3.5in. bazookas, two flamethrowers, and nine BARs. The outpost was defended by 350 yds of trench, 2ft wide and 5–6ft deep. On May 26, 1953 Carson was defended by elements of Company C, 5th Marines. Two Chinese platoons (red arrow) attacked after nightfall, overrunning two small outposts to the northeast. Carson's trenches were penetrated, but the enemy was ejected by hand-to-hand combat. The two overrun outposts were retaken by counterattack.



Troops dig in on a Korean ridge. The stacked sandbags to the left will be used to provide overhead cover on certain trench sections. Note that even the troops who are digging are wearing their body-armor vests, indicating that enemy mortar fire was frequent.

When the relatively stable MLR was established positions were organized somewhat haphazardly with units dug in where they had halted. Over time there were adjustments in the line. Forward to the MLR an OPLR, generally referred to as the "outpost line (OPL)," was established to place surveillance on Communist positions and warn of attacks. These were often perched on small hills and the ends of ridges thrusting toward enemy lines. Reinforced squads and platoons manned these outposts. A regiment's reserve battalion provided them. Deep communications trenches running along crests connected the outposts, hundreds of yards beyond the MLR, sometimes up to 2,500 yds. Most of the far outposts were abandoned in April 1952, although near outposts were retained. From November 1951 to the cease-fire, much of the fighting was what was referred to as the Outpost Battles.

The MLR was defended by company and platoon strongpoints often interlinked by communications trenches. Many strongpoints were not connected though. Others were strung along ridge crests and organized into smaller trench-connected strongpoints. All strongpoints and combat outposts from squad to company size were designed for all around defense and protected by on-call "box-me-in" artillery barrages.

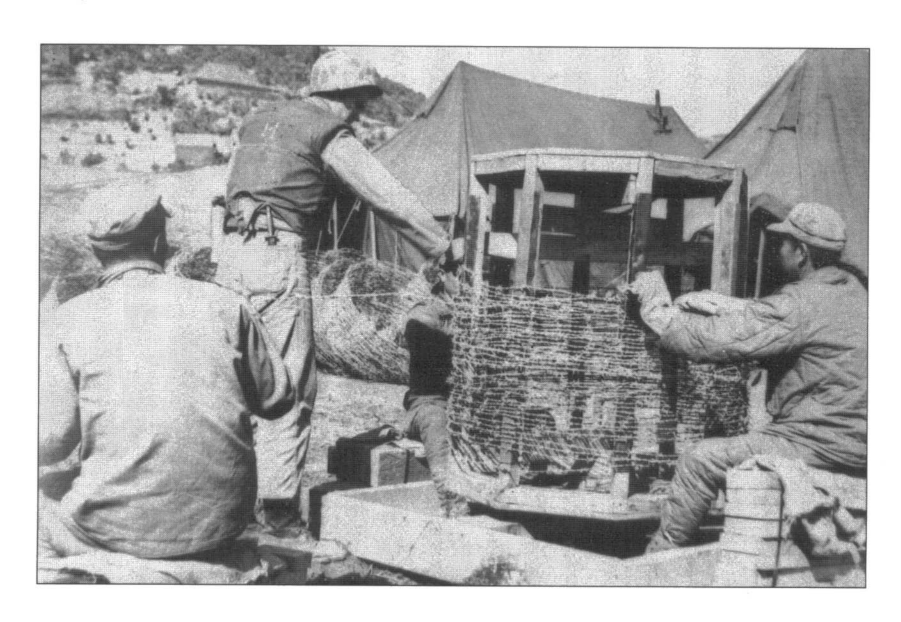
The strongpoints typically consisted of a fighting trench surrounding the hill's crest or running along the ridge's topographical crest. Overhead cover might protect sections of the trench. Fighting bunkers were placed at various intervals, perhaps 20 yds apart, all round the strongpoint. These housed machine guns, BARs, and riflemen. Tank slots, RR emplacements, and mortar pits would be positioned as necessary. Bazookas and flamethrowers were fired from open-topped emplacements. CPs, kitchen and sleeping bunkers and ammunition holes would be on the rear side of the hill, but within the perimeter. An access road in the rear allowed resupply. The unarmed Korean Service Corps provided much of the labor on these positions, although troop units also built the strongpoints and obstacles for security reasons, and maintained and repaired them because the Service Corps was not to work on or forward of the MLR. To reinforce the defense of strongpoints and outposts,

additional weapons over the unit's normal allocation were provided on a sector basis, which remained in their emplacements when a unit was relieved.

Construction deficiencies were common. Bunkers and individual firing positions were often constructed allowing the weapons/individual to direct fire in the valley and the base of the hill, but the higher slopes could not always be fired on or seen unless the firer leaned up and out of his position. Communications trenches connecting outposts and strongpoints were often so deep that they could not be used as fighting trenches to place flanking fire on the enemy advancing upslope between outposts. Many bunkers, especially sleeping and other non-fighting bunkers, had so much overhead cover that the timber and sandbag walls could not adequately support them under heavy artillery fire causing them to sometimes collapse. Often drainage had been poorly planned causing tons of snowmelt to flood and collapse positions.

Tanks and self-propelled weapons were employed by both sides in the infantry support role. In the defense, tanks, halftrack-mounted quad .50-cal. machine guns, and full-tracked twin 40mm AA guns were dug-in hull defilade in shallow bulldozed pits surrounded by parapets ("tank slots"). Because of the war's static nature from late 1951, extensive use was made of artillery emplacements with full overhead cover.

By the winter of 1952/53 the positioning of defenses had evolved and adapted to the situation in Korea. It was found that if trenches were dug below the topographic crest they could easily be hit by artillery. A trench line following the topographic crest presented a knife-edge target with many rounds striking below the crest or passing over. To cover forward slopes and open ground before the ridge, emplacements were dug a short distance down-slope and connected to the main trench by communications trenches. Standard procedure was to place machine guns in draws (reentrants), the low area between spurs protruding from slopes—natural avenues of approach. The Chinese could attack up these, but were just as likely to attack up spurs as well. Machine guns were emplaced instead on the spurs to cover their slopes and the draws between them. Instead of a continuous defensive line, certain spurs were selected on which small strongpoints were emplaced forward of the MLR and connected by communications trenches. A different type of barbed wire obstacle was also used—the "Canadian" or "random wire" consisting of two parallel rows of three-strand wire about 3ft high and 3ft apart. The space in between was filled with wire zigzagging at random between the two rows and/or concertina.



Korean Service Corps workers fabricate concertina wire under the supervision of a Marine engineer. Pre-fabricated concertina was available, but it was still made in the field.

The test of battle

Normandy

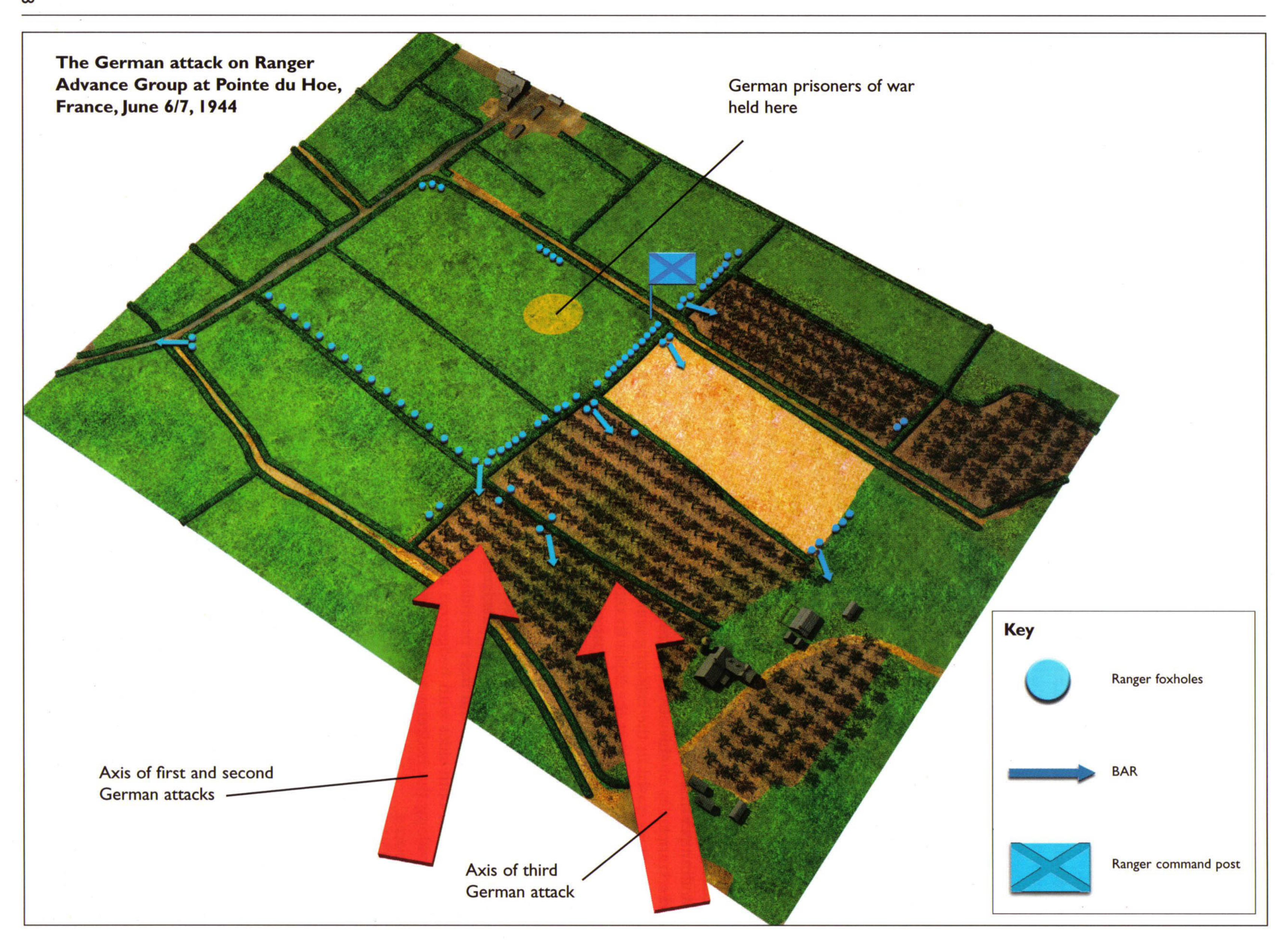
This small-scale defensive action was conducted by elements of the 2d Ranger Infantry Battalion at Pointe du Hoe after their famous June 6, 1944 assault of the Point's cliffs on D-Day. A 155mm gun battery covering Omaha Beach was the Rangers' objective. Once they gained the 85–100ft-high cliffs it was found the guns had been removed. Patrols found the hidden guns and spiked them. The isolated understrength battalion now had to resist determined German counterattacks until relieved by assault troops fighting their way from the beaches. While organized and armed much differently than a conventional infantry battalion (six 68-man two-platoon companies), this action demonstrates how a small unit could organize its defense when undermanned and forced to cover a wide frontage and what went wrong.

Only the battalion's D, E, and F companies took part in the assault with 225 men including a headquarters detachment and a 81mm mortar section. Each company had only four BARs and two 60mm mortars. Causalities during the assault had been moderate, but there were only about 160 effectives atop the Point covering a wide frontage with light firepower and scattered in small elements. Small groups began to move from the battery position to the Grandcamp-Vierville Highway 800 yds to the south with some 60 men from all three companies of this advance group reaching it by 0815 hours. German resistance increased in the morning and two counterattacks were launched at the Rangers remaining at the Point in the afternoon. These attacks by-passed the advance group, which was patrolling aggressively and took some 40 prisoners. Groups from Companies E and F moved 300 yds south of the highway and established a defensive line while the Company D group set up a road block on the highway to the west.

The terrain in the area was flat, crisscrossed by hedgerows dividing up the orchards and wheat fields. The low hedgerows were earth and rock berms topped by dense hedges and trees providing excellent cover. The area's roads were lined on both sides with hedgerows and ditches. The Rangers dug their foxholes along the hedgerows. One-man foxholes were used, but they were closely spaced.

Before nightfall the Company D group extended to the south to link-up with the Company E group forming an L-shaped position. They positioned a two-man outpost 100 yds up the highway at an intersection. The Company F group was on-line to E's east with both facing south well dug into a ditch behind their hedgerow. The ground slopped gently to the south providing good fields of fire. However, even though there was a near full moon and it was partly cloudy, the trees' shadows obscured night observation.

The advance group's CP was located near the east end of the line. While the Company F commander was senior, he did not feel he was formally in charge. Officers from the different companies informally cooperated with no centralized control, although the Company F commander made final decisions when necessary. The German prisoners were moved into the center of the field behind the CP and ordered to dig-in for their protection. A couple of outposts secured the east flank, one on the highway and the other midway between the highway and the F Company line. Two hours before dark a 23-man platoon from Company A, 5th Ranger Battalion joined the advance group after fighting its way from Omaha Beach. Its men were scattered among the other companies.


The German attack on Ranger Advance Group at Pointe du Hoe, France, June 6/7, 1944
German prisoners of war held here
Axis of first and second German attacks
Axis of third German attack
Key
Ranger foxholes
BAR
Ranger command post

The enemy threat was assessed as coming from the west and south. A BAR was positioned at the angle of the "L" and three two-man outposts were established covering hedgerows west and south of the angle. A group of seven men with a BAR dug in 250 yds south of the CP covering an approach road and a group of stone farm buildings. Most of them were dug in behind a stonewall and they positioned a farm roller to their right for cover. The advance group had about 85 men with nine BARs, not even the strength of a full rifle company. The Company E group also had three German machine guns and there were plenty of captured grenades.

At 2330 hours the Germans opened fire at close-range on both sides of the angle having been undetected by the outposts. Some of the men in the outposts were killed and wounded and others withdrew. The inexplicable detonation of German propellant charges in the site where the 155mm guns had been hidden to the west briefly silhouetted the attackers and they withdrew. The outposts were not reoccupied and some Rangers repositioned facing to the west as that now appeared to be the direction of the threat. This resulted in the angle being undermanned. The second attack hit at 0100 hours preceded by heavy automatic weapons and scattered mortar fire. The Germans had closed within 50 yds before launching the attack at the angle. The BAR man and rifleman still at the angle was killed after inflicting German casualties. The Germans now occupied the 50-yd gap at the angle. The decentralized command arrangement led to leaders not having a clear grasp of the situation. Some thought the entire west side of the line was overrun and considered withdrawing back to the Point. No counterattack was launched. No one reconnoitered to find out the situation at the angle because of the danger of being shot by other Rangers. Ammunition was low.

At 0300 the third attack was launched developing as the previous attack, but this attack's weight hit near the center of the south line east of the angle. German's penetrated the line and rolled it up to the west toward the angle. The Rangers either died in situ or were captured; none withdrew. It was now obvious in the CP that the line was broken and the order was given to withdraw. A light attack hit the CP's portion of the line from the wheat field as this was in process. Some Rangers reinforced this area, but the withdrawal continued. A few Rangers did not receive the order and were left behind, but most made it out to the north. They halted at the highway and found that most of Company F was present plus a few from D and E. About 50 men made it back to the Point by 0400 with a few stragglers trickling in. Most of E and a few from D were killed and 20 captured. The survivors established a hasty defense around the former German battery. About a dozen men of Company D had remained in the northern portion of the west line though. They had not been notified of the withdrawal and when they realized it was in progress Germans were in the field behind them. The Germans liberated the prisoners held by the Rangers at this time. This small group hid in a ditch beneath the hedgerow for two days. The Germans never checked this portion of the position. Other German counterattacks hit the Point over the next two days. On D+2 the 116th Infantry relieved the Rangers. Only 90 men were combat effective.

The study of this small action reinforces the importance of many of the basic principles of an effective defense. The hedgerows allowed the Germans to close within 25–50 yds of the position, and this severely restricted the ability of the outposts to warn of their approach. A lack of centralized command and poor communications were key failures. Insufficient troops were available to establish a support platoon in reserve, which could have been used to plug the gap at the angle.

Korea

This study of a rifle company strongpoint does not describe a combat action, but details the layout of a typical position in January 1953. The unit is Company I, 3d Battalion, 35th Infantry, 25th Infantry Division. This position

This hastily constructed command post in Korea in September 1950 consists of a tarpaulin-covered shallow pit with the spoil piled to the front. In the right foreground is a slit trench covered by earth-filled 105mm ammunition boxes for overhead cover. Such simple CPs were employed in fluid situations where frequent displacement was expected.



was near the center of the frontline in mountainous central Korea north of the 38th Parallel. The terrain in the area was a wandering maze of ridges and hills with spurs radiating into narrow winding valleys. The low areas were water saturated, and all trees had been cut for fortification materials. The ridge sides averaged a 20-degree slope, but some were as steep as 40 degrees. The ridges in the company sector were up to 320–350m above sea level and the valley 250m. The company's sector began at a small stream in a narrow valley running eastward, up the end of a ridge, along the ridge's length, hooked south around a knoll, and ended in a deep saddle. The many ridge fingers offered the enemy numerous avenues of approach and greatly limited grazing fire on the forward slopes. The sector was 1,500 yds wide, but the trench line was 2,000yds. It was immediately below the geographic crest. A normal company frontage was 600–1,200yds. Company strength was 220 including 48 Korean augmentees. All three rifle platoons were in the frontline. Platoon CP bunkers were just over the crest behind the trench. The company CP, mortar section, and company communications, supply and kitchen bunkers were located in the vicinity of the hook on the line's east end. The headquarters and mortar section were tasked as a counterattack force since there was no support platoon. Two OPs were located in the hook area. The forward OP was a large bay in the trench occupied at night by artillery and mortar forward observers and platoon leaders when patrols were out. The rear OP was on the crest and was a stout bunker used by forward observers during the day. The defensive positions had been built by earlier occupying UN units with each conducting further work and improvements. Four double-apron fences protected the valley and the rest of the line had two double aprons. Many mines had been laid forward of the trenches by different units.

There were 38 bunkers with most about 80 percent below ground. The sides were sandbag-revetted and roofed with 5–10in.-diameter logs, covered with two or three layers of sandbags, and a 2–3ft burster layer of earth and rocks. Most bunkers were divided into two compartments, a fighting compartment and a living area for 4–6 men. Firing ports averaged 18in. high and 36in. wide. All bunkers with an automatic weapon had a field telephone linked to the platoon CP. At night all automatic weapons were manned, sentries spotted along the trench, roving guards walked the trench and patrolled the rear slopes.



A 14th Infantry, 25th Infantry Division 4.2in. M2 heavy mortar crew prepares to fire. The position is merely a circular parapet of sandbags built on ground level. The ready ammunition rack has a canvas tarp to protect the rounds from rain and direct sunlight. In the background is the crew's quarters built of earth-filled mortar ammunition boxes.

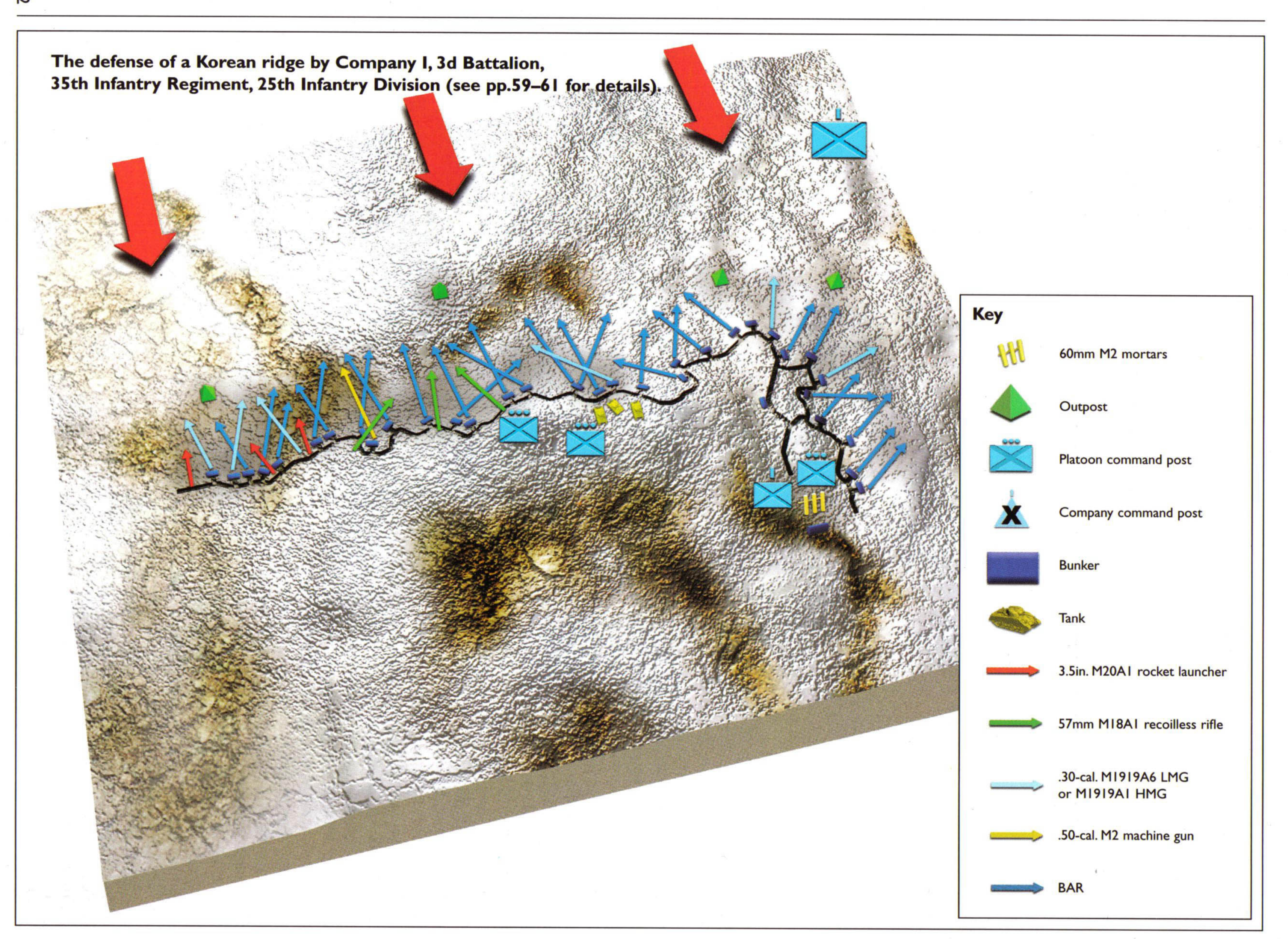
Of the 38 bunkers 34 housed automatic weapons: one .50-cal. HMG, six .30-cal. HMGs, 12 .30-cal. LMGs, and 15 BARs. The .50-cal, five HMGs, six LMGs, and five BARs were sector weapons. Three 3.5in. M20A1 bazookas and three M2-2 flamethrowers were positioned in trench firing bays with the former in a valley, as this was a tank route. The company's three 57mm M18A1 recoilless rifles were in open emplacements behind the trench on the west end of the ridge covering the valley. Three 76mm gun-armed M4A3E8 Sherman tanks were dug in behind the trench in the 2d Platoon sector. They also had defilade positions on the ridge's reserve slope.



Troops of the 23d Infantry, 2d Infantry Division dig in on the rear slope of Old Baldy, a heavily contested hill. A troop shelter is to the left and to the right a crew fills sandbags, which are stacked in preparation for use.

Four combat outposts were situated 100 or so yards forward of the trench, consisting of four two-man foxholes in a diamond pattern. These were partly covered by logs and earth. A diamond-shaped double-apron barrier surrounded the outposts with triple concertina barriers both inside and outside the double-apron fence. An NCO, a BAR man, and two riflemen manned them only at night. The NCO called in by phone to the platoon CP every 30 minutes. Company L manned an outpost designated Harry some 200 yds northeast of the trench line's hook.

The Chinese strongpoints were as little as 500yds from the company's positions and some US outposts were almost within grenade-throwing distance. The Chinese held ground some 120yds higher than the American positions and possessed excellent observation. Daily sniper duals were common, as were firefights between patrols in no man's land. Because of the proximity of the Chinese 80 percent of bunker and trench repairs occurred at night.



The defense of a Korean ridge by Company I, 3d Battalion, 35th Infantry Regiment, 25th Infantry Division (see pp.59–61 for details).

An assessment of US field fortifications

The US had sufficient engineer, equipment, and *matériel* capabilities to construct substantial field fortifications and obstacles when necessary. Most units though relied on their own somewhat limited resources for construction tasks. Infantry field fortifications, usually occupied for short periods only, were seldom elaborate or heavily constructed, but in most cases they were sufficient for their purpose. There were problems though, especially with regard to construction practice. Inadequate support of overhead cover was frequent.

There were also common errors in locating positions. MLR defensive emplacements tended to be positioned in thin lines with little depth to the defense. Mobile reserves were relied on to counter shallow penetrations, and were usually adequate for this purpose. Sectors of fire for infantry fighting positions and crew-served weapons were spread along the front with few positioned in depth, as it was common for units to be assigned frontages wider than allowed by doctrine. The sectors of fire often overlapped, but there was little beyond that in the way of providing mutual support to adjacent positions—and certainly nothing similar to German and Japanese examples. Gaps between units, especially between battalions and regiments, were often inadequately covered by fire.

Hill and ridge-top emplacements were often situated to provide grazing fire only a short distance to the front. Depending on whether the slope was convex or concave, much of the slope might not be adequately covered by fire. Firing ports were often too poorly oriented to effectively cover assigned sectors of fire.

One of the most frequently seen weaknesses of US defensive positions was poor camouflage, especially camouflaging positions from aerial reconnaissance. Even concealment from ground observation was sometimes poor. The use of dummy positions and decoys was almost non-existent, and little effort was made to conceal obstacles. The priority was to position them in the most advantageous locations.

The above-cited deficiencies were by no means widespread, merely the most commonly encountered. The Americans demonstrated a great deal of flexibility, ingenuity, and initiative in adapting their doctrinal defensive tactics and techniques to the unique terrain and weather conditions they experienced. While standardized plans were provided for field fortifications and obstacles in field manuals, little training was provided on their construction, and the manuals were seldom available in the field. This resulted in a great deal of variation and initiative, an aspect encouraged by the manuals themselves.



In mobile warfare command posts were temporarily located in any defiladed position that could be found. Forward CPs were kept as small and mobile as possible.

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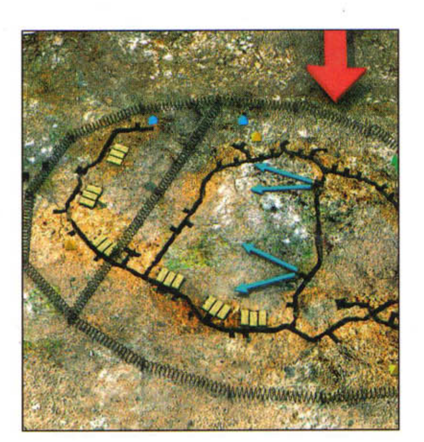
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Design, technology, and history of key fortresses, strategic positions, and defensive systems

US WWII and Korean War Field Fortifications 1941–53

The US Army and Marine Corps in World War II subscribed to a mobile-warfare doctrine that envisioned field fortifications and obstacles as temporary in nature. As a result, the design of such fortifications was simple and made use of local materials, and they could be constructed comparatively quickly, while still providing adequate protection. This book addresses field fortifications built by US infantrymen during World War II and later in Korea, and covers rifle platoon positions, trenches, crew-served weapon positions, bunkers, dugouts, shelters, observation posts and anti-tank obstacles.



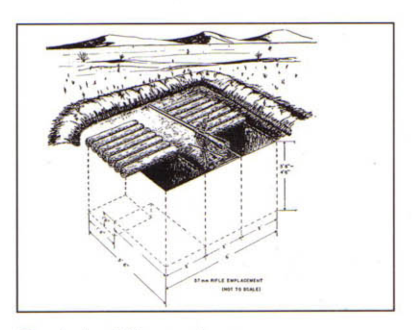
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